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(54) **SLAB CONSTRUCTION SYSTEM AND METHOD FOR CONSTRUCTING MULTI-STORY BUILDINGS USING PRE-MANUFACTURED STRUCTURES**

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See application file for complete search history.

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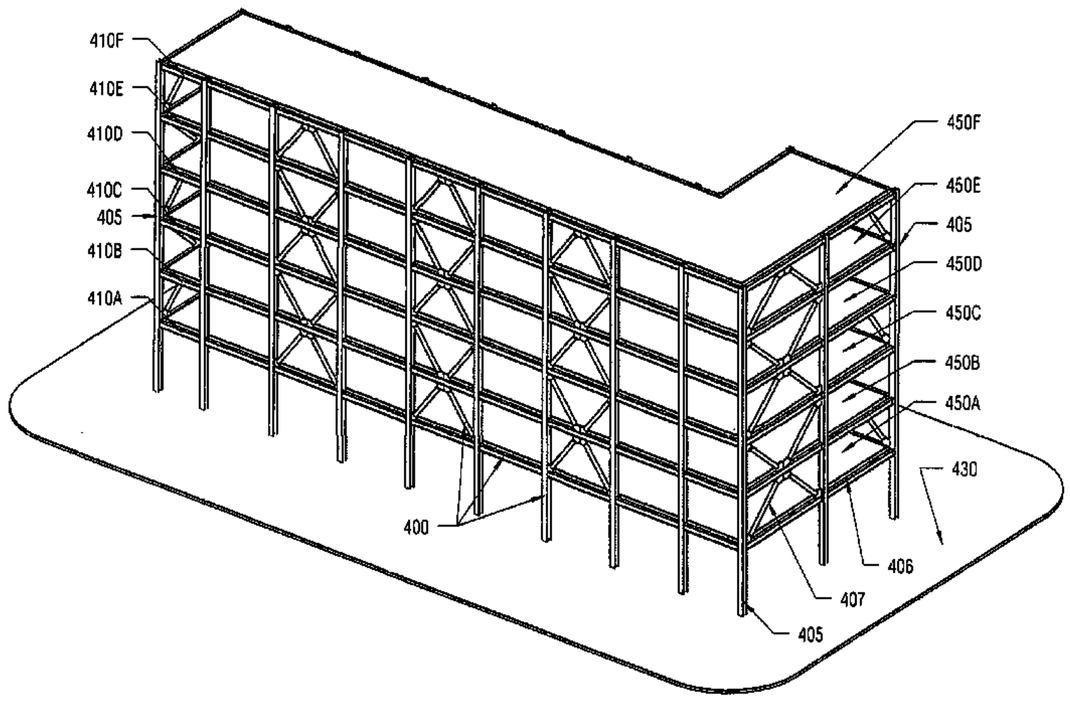
(57) **ABSTRACT**

The present invention integrates the use of pre-manufactured structures with minimal on-site installation and lift-slab construction to achieve the construction of multi-story buildings. The pre-manufactured structures are designed to be readily integrated with both horizontal and vertically adjacent building components, including lift-slab components, so that multiple building stories may be readily and securely stacked, one on top of the other. The present invention



advantageously permits top-down lift-slab construction for multi-story buildings. The present invention also provides for the development of flexible design plans for institutional, residential, office and other types of buildings. The present invention advantageously provides for easier, more efficient, faster, cheaper, safer, higher quality and more consistent, environmentally advantaged, energy-efficient, easier to maintain, intelligently designed, and customizable multi-story building construction.

18 Claims, 57 Drawing Sheets

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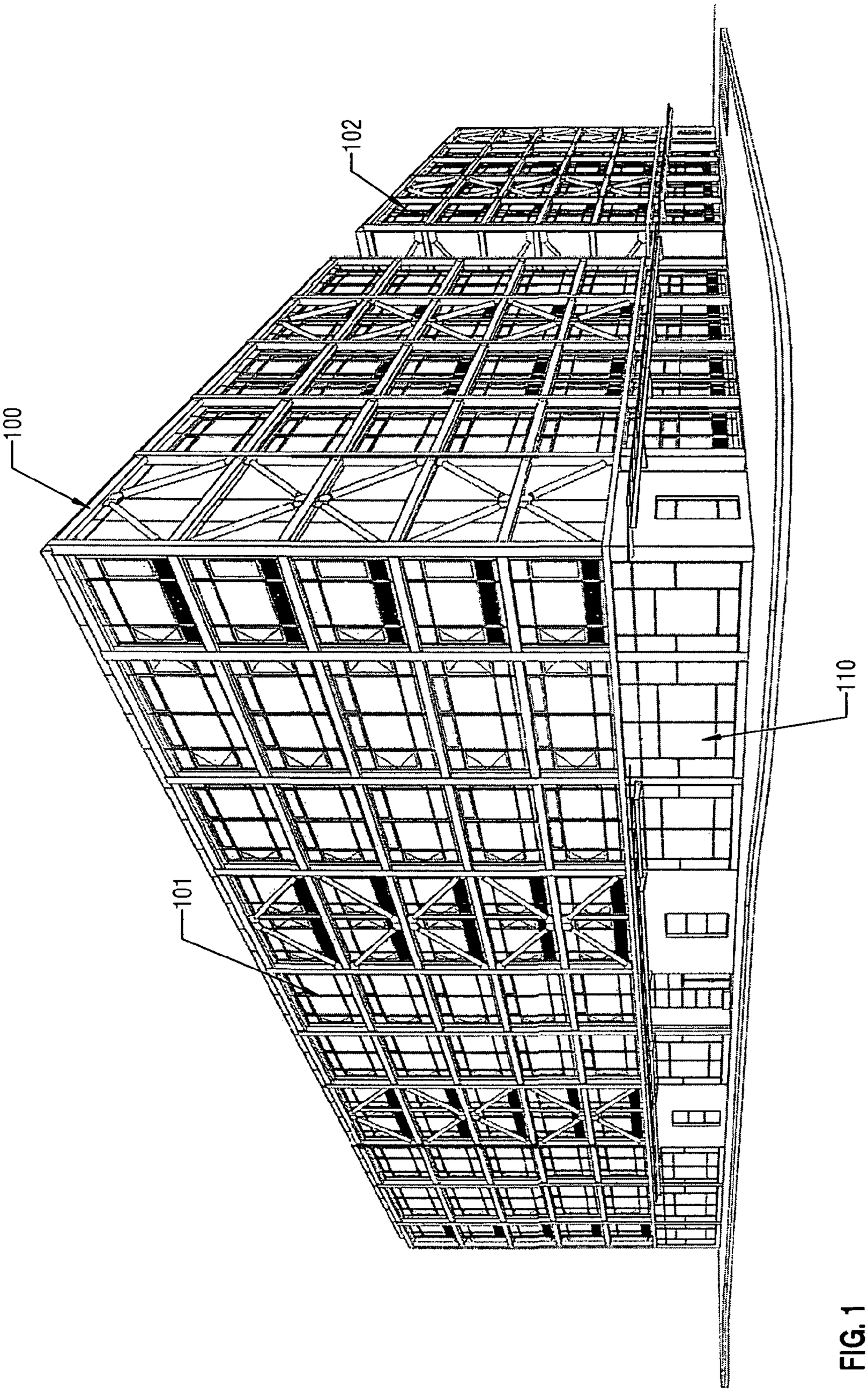


FIG. 1

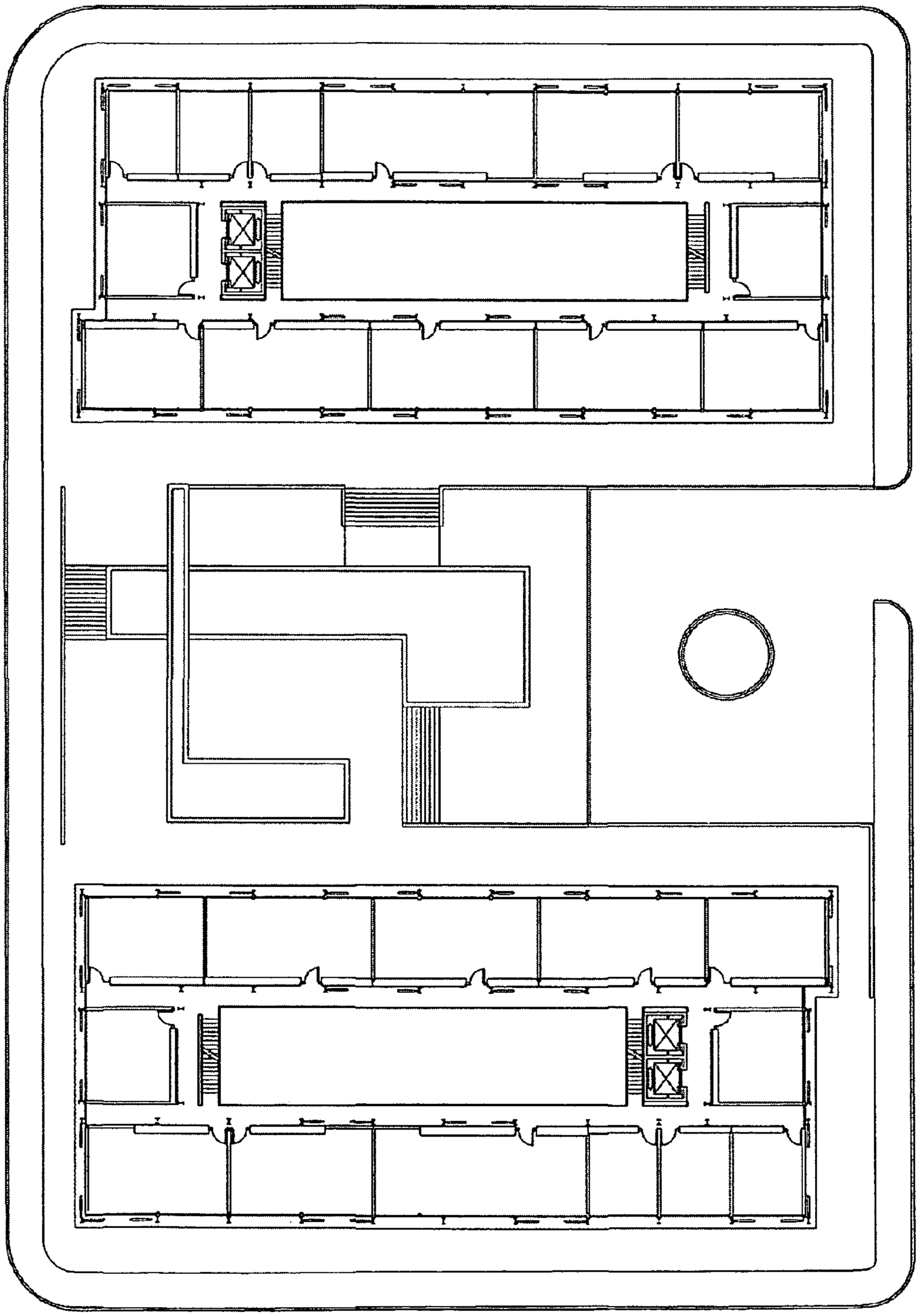


FIG. 2A

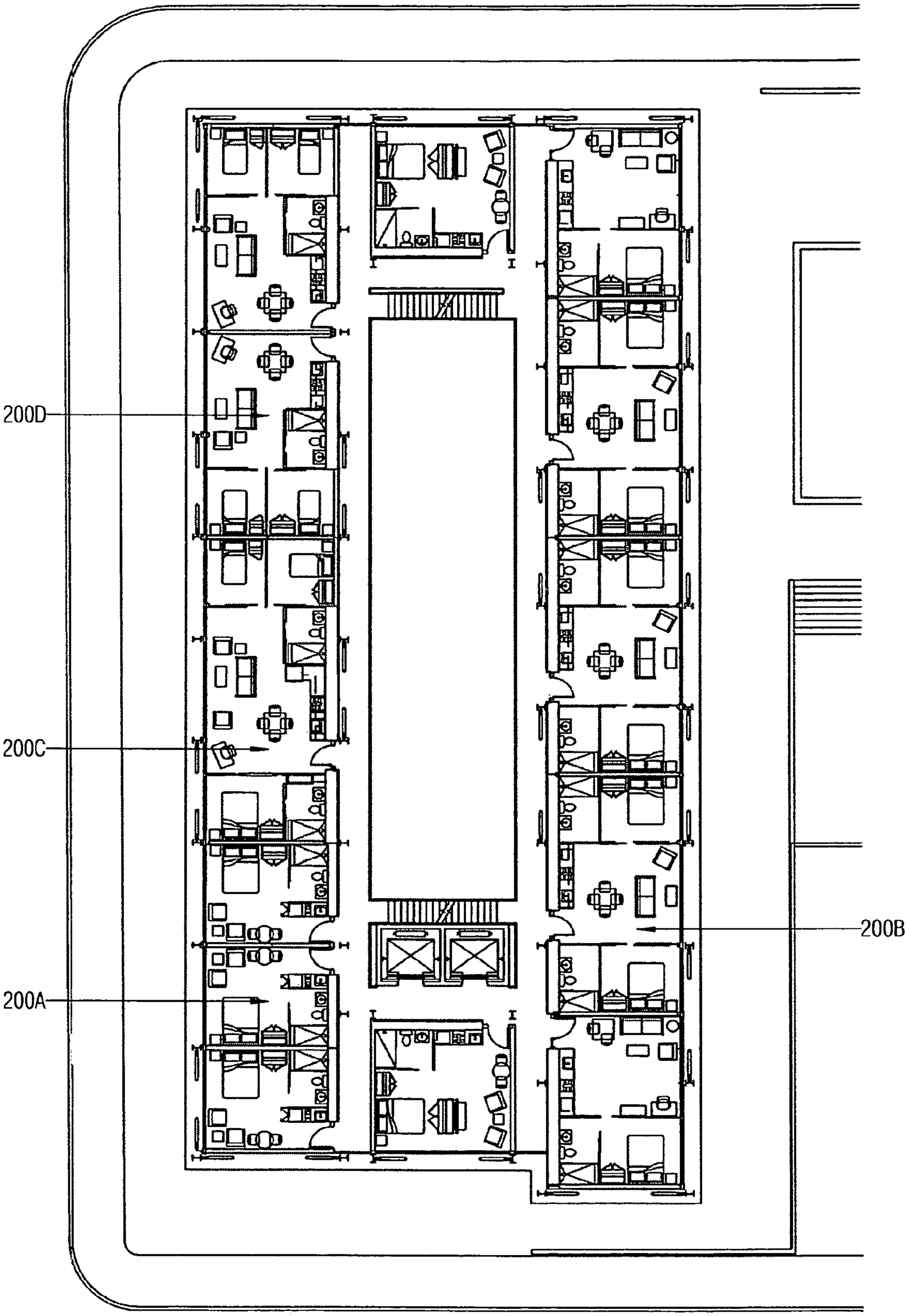


FIG. 2B

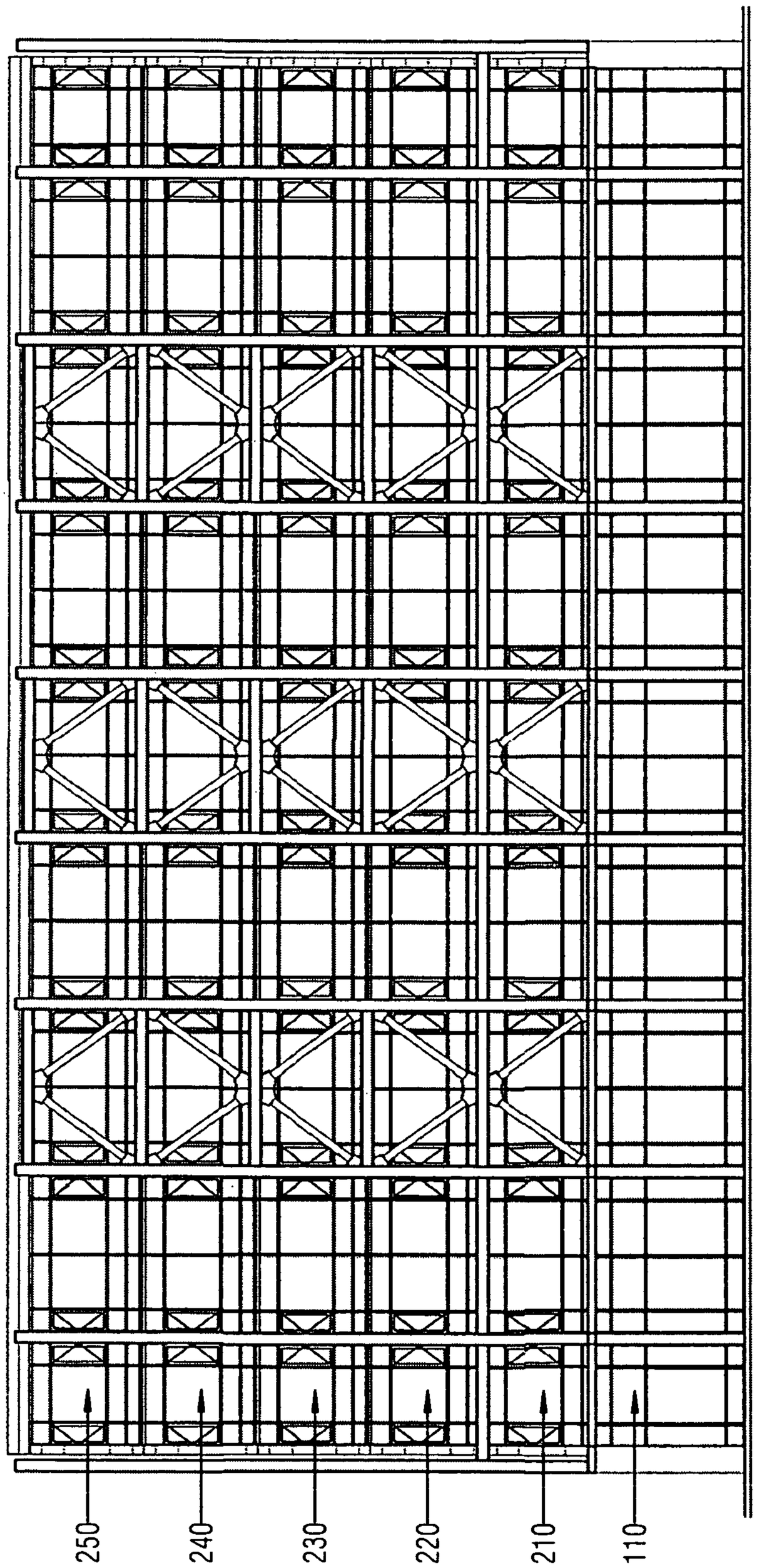
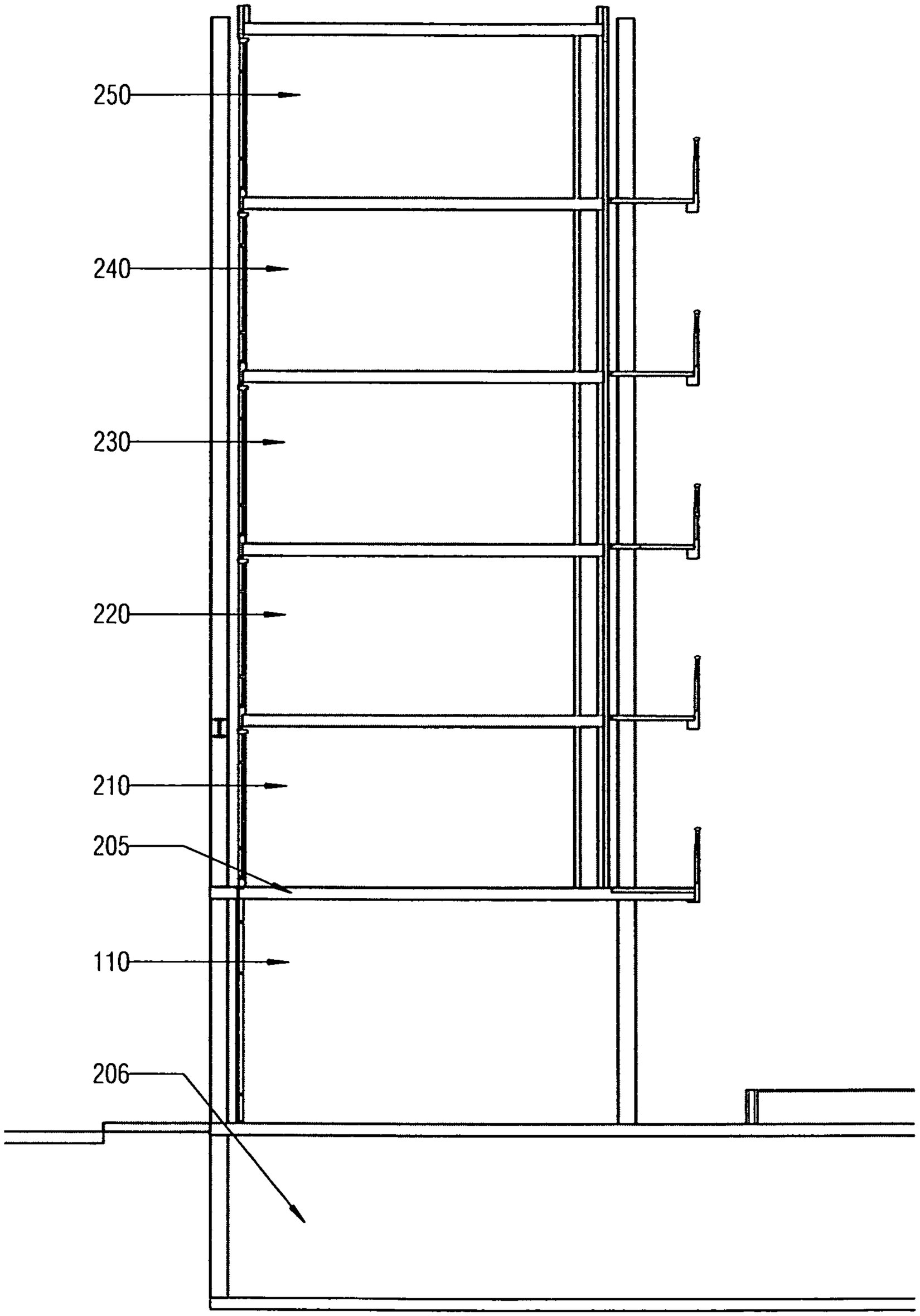


FIG. 3



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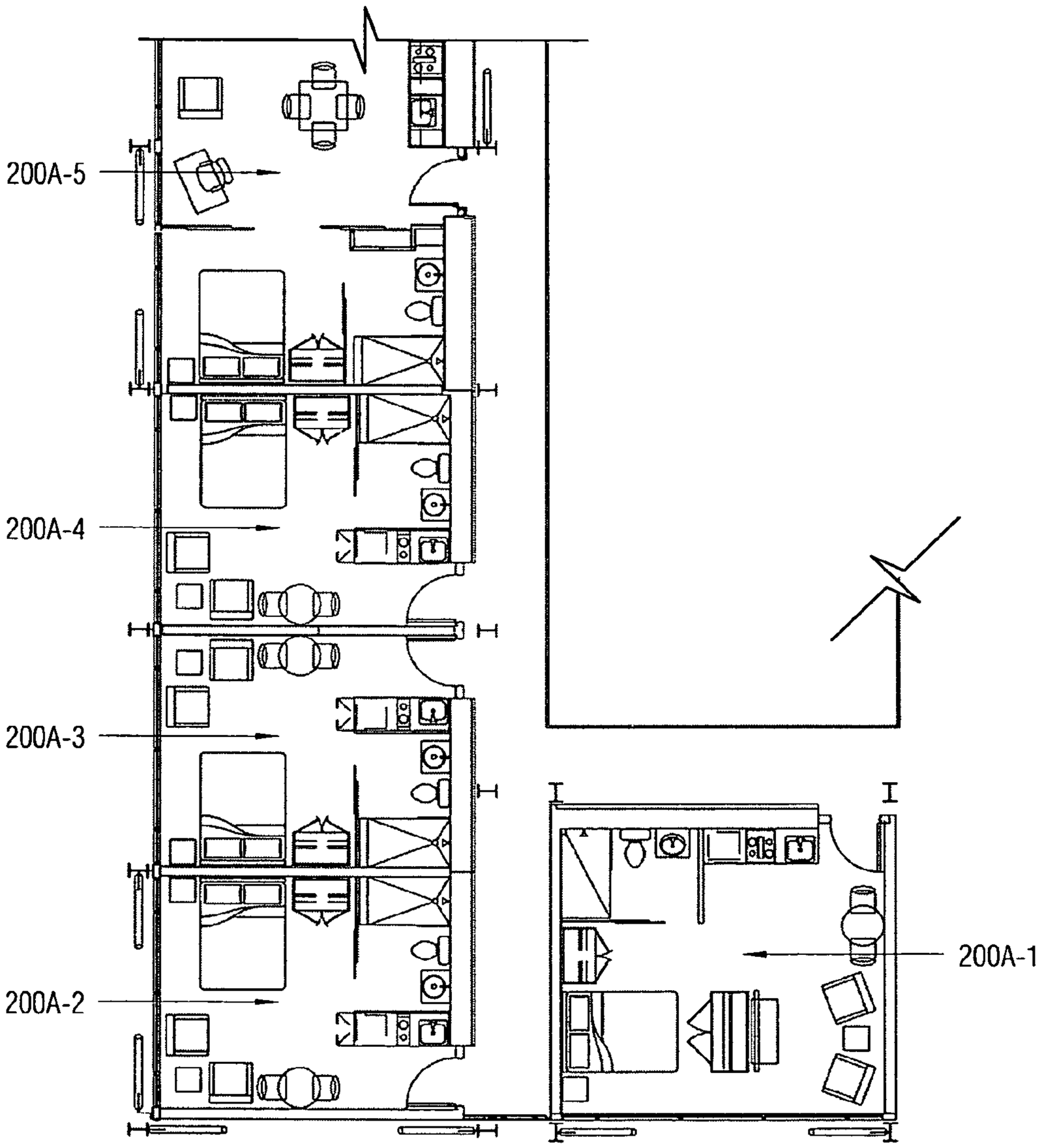

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FIG. 5A

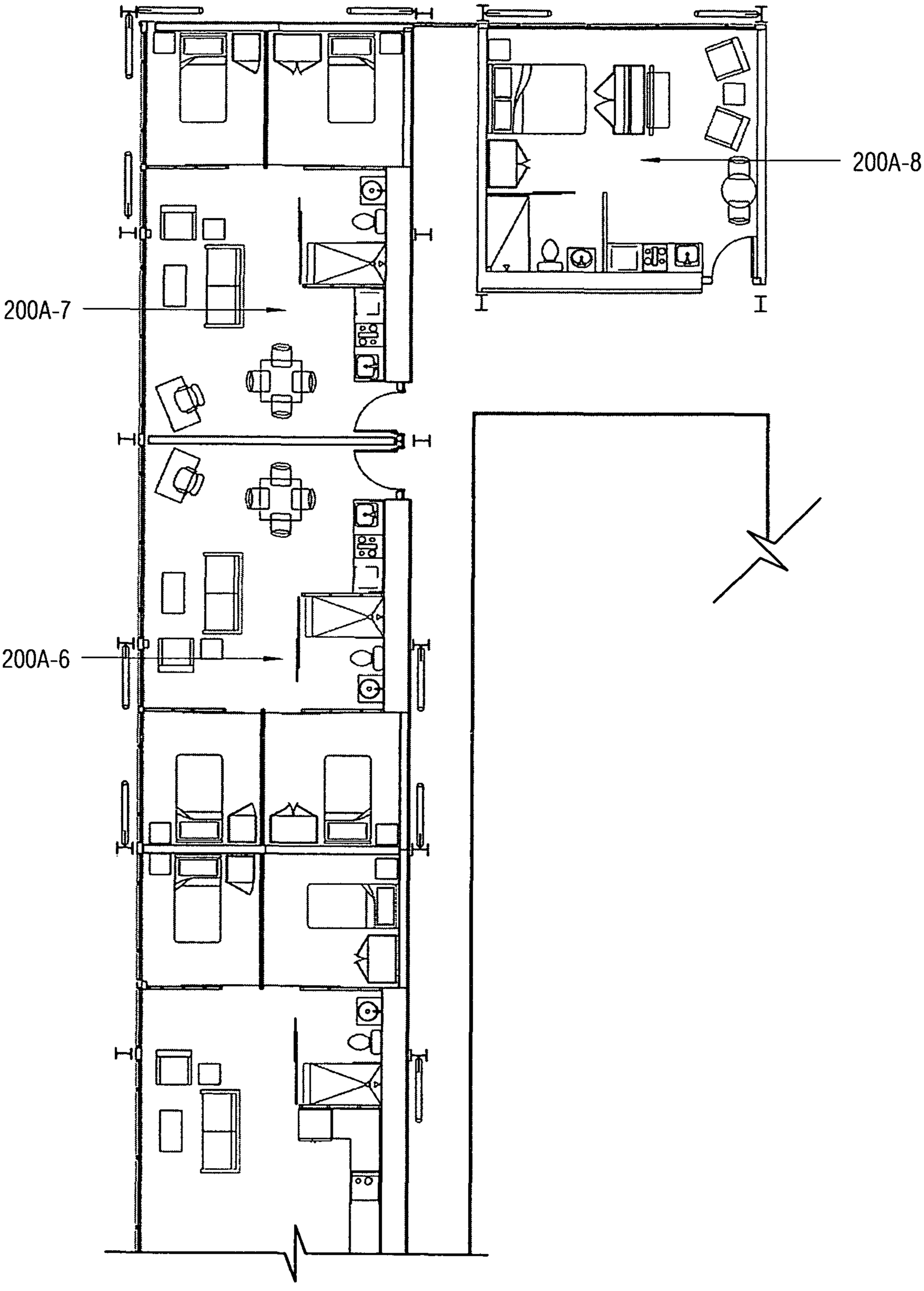


FIG. 5B

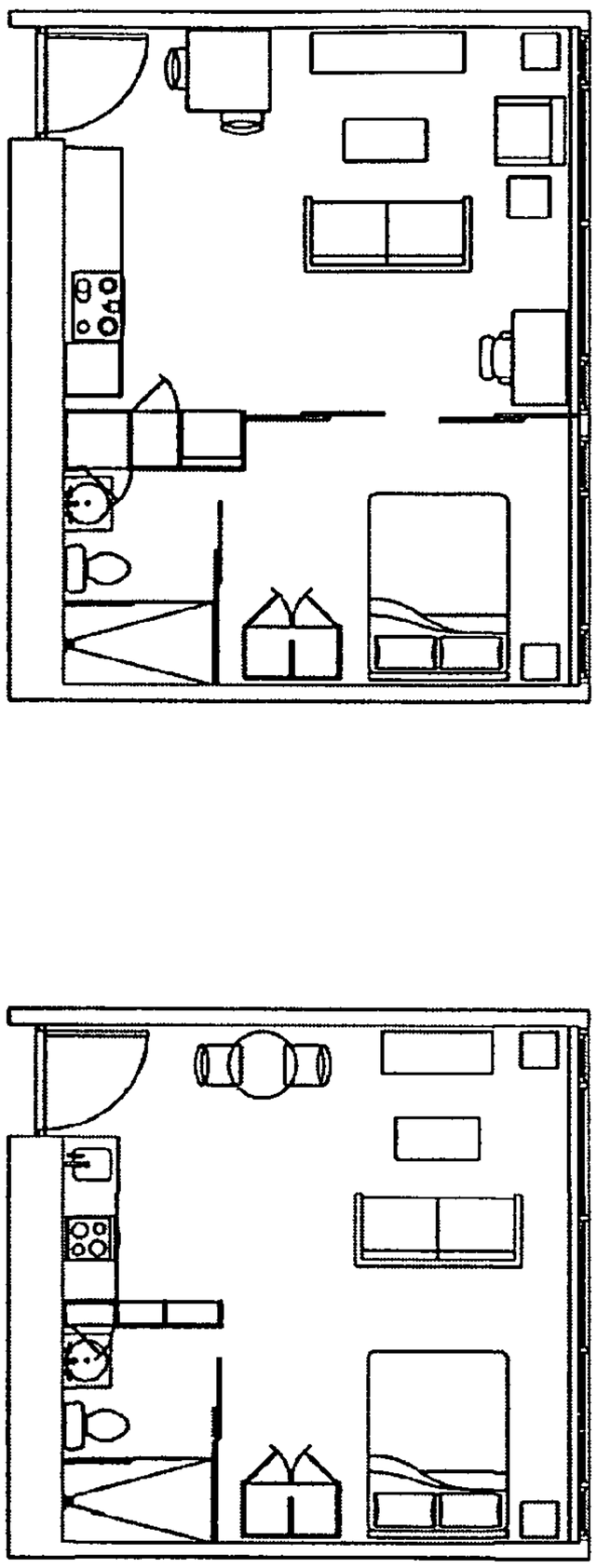


FIG. 6A

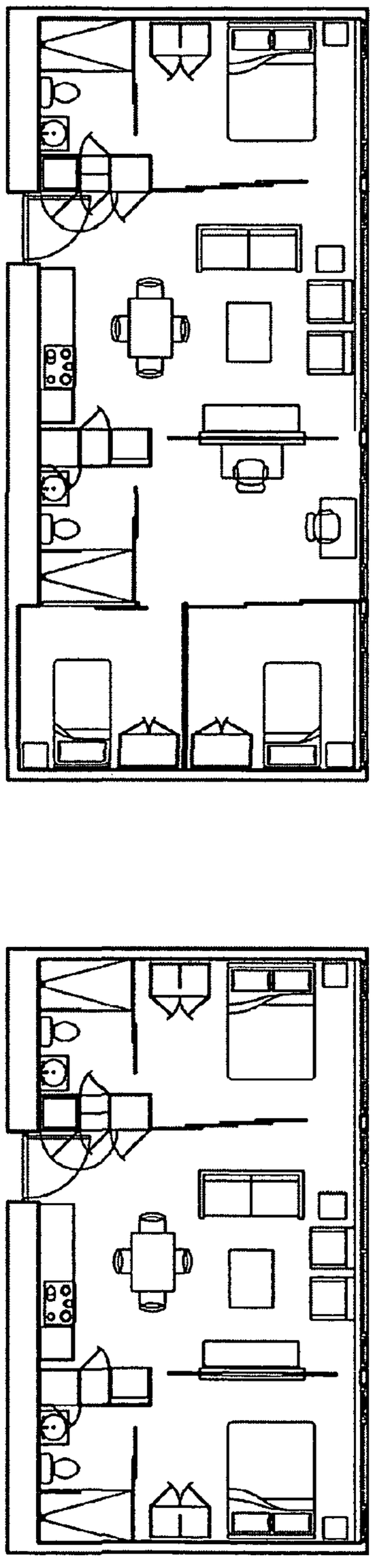


FIG. 6B

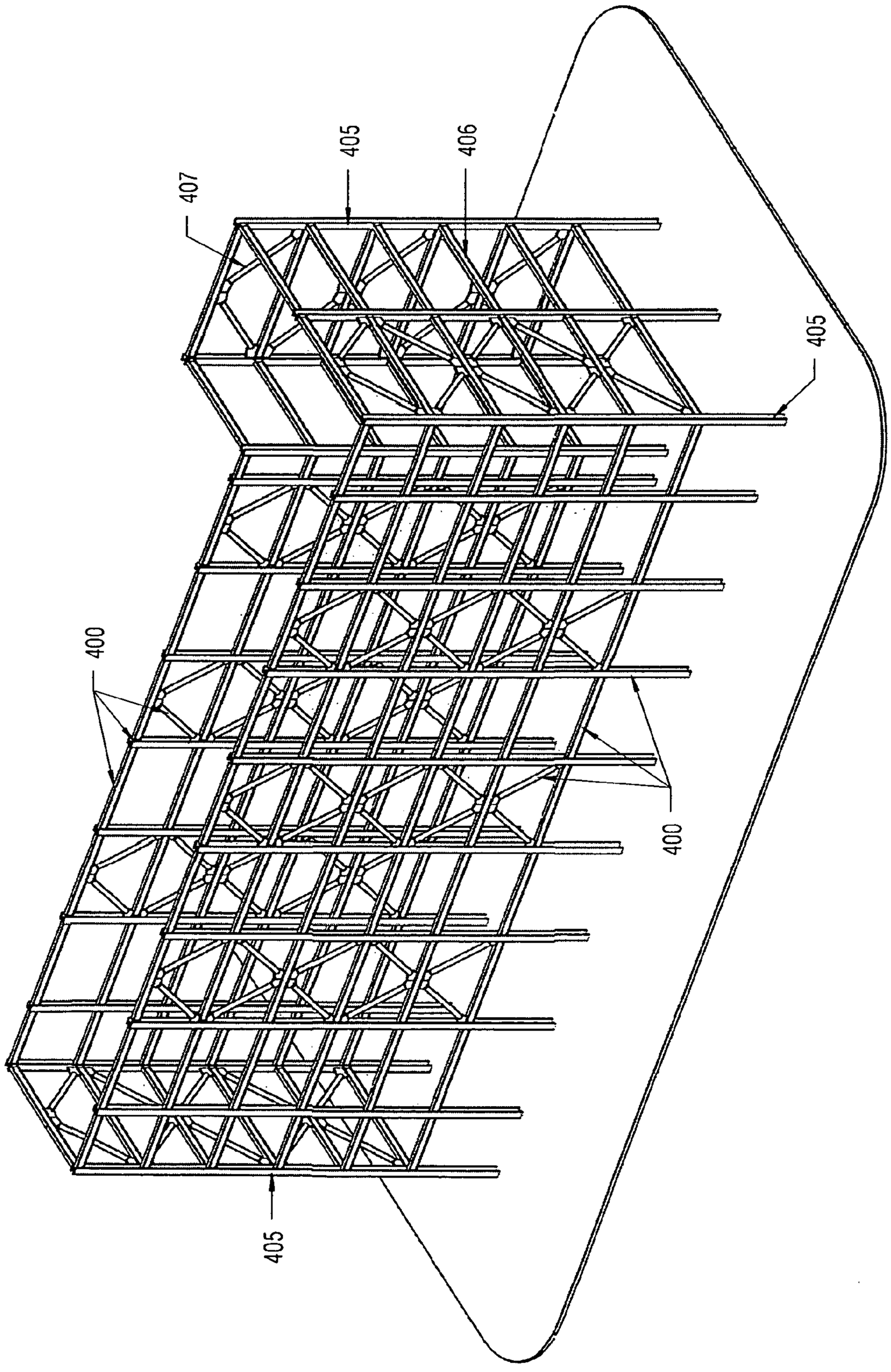
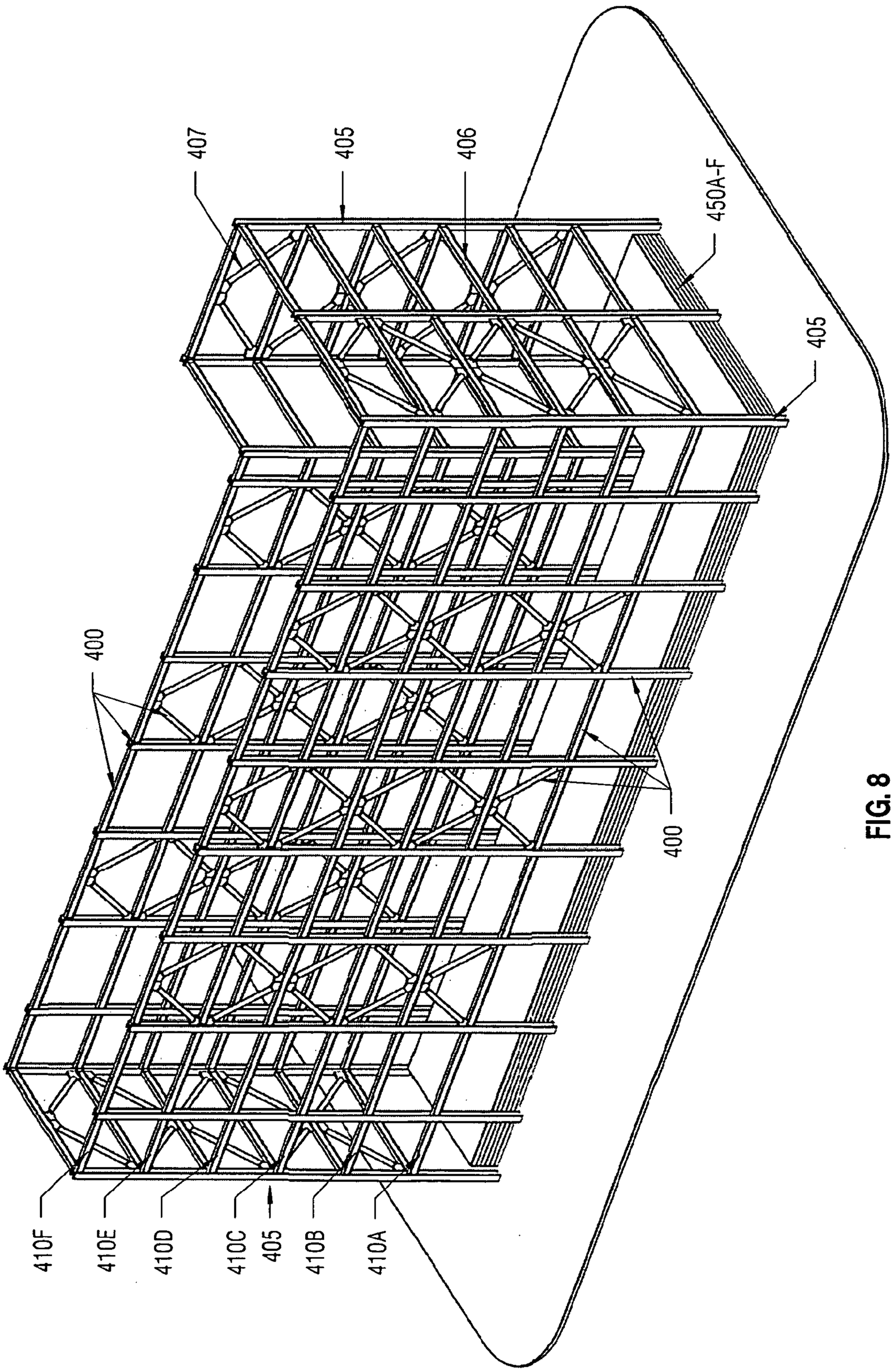


FIG. 7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410C
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FIG. 8

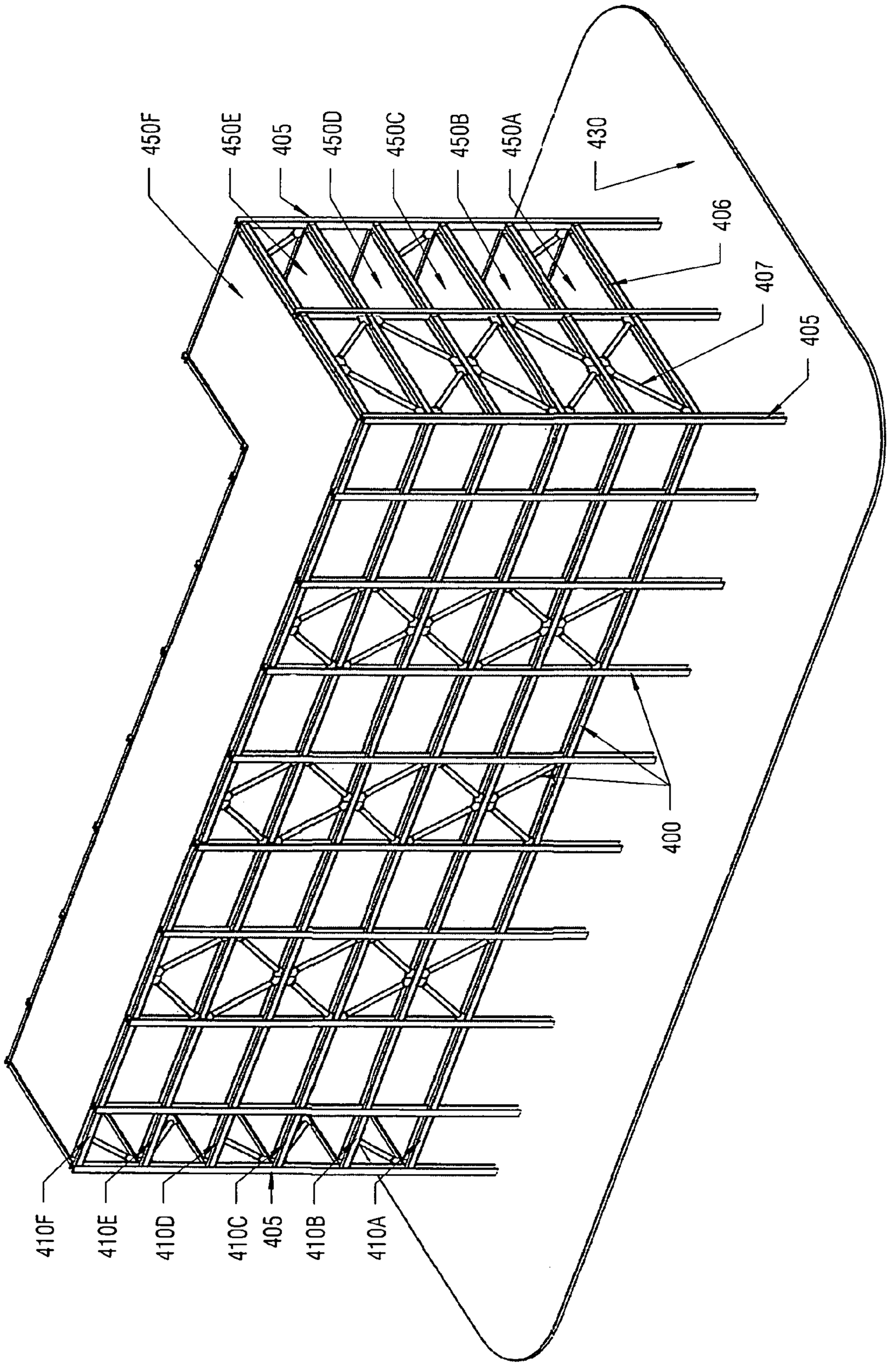
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FIG. 9

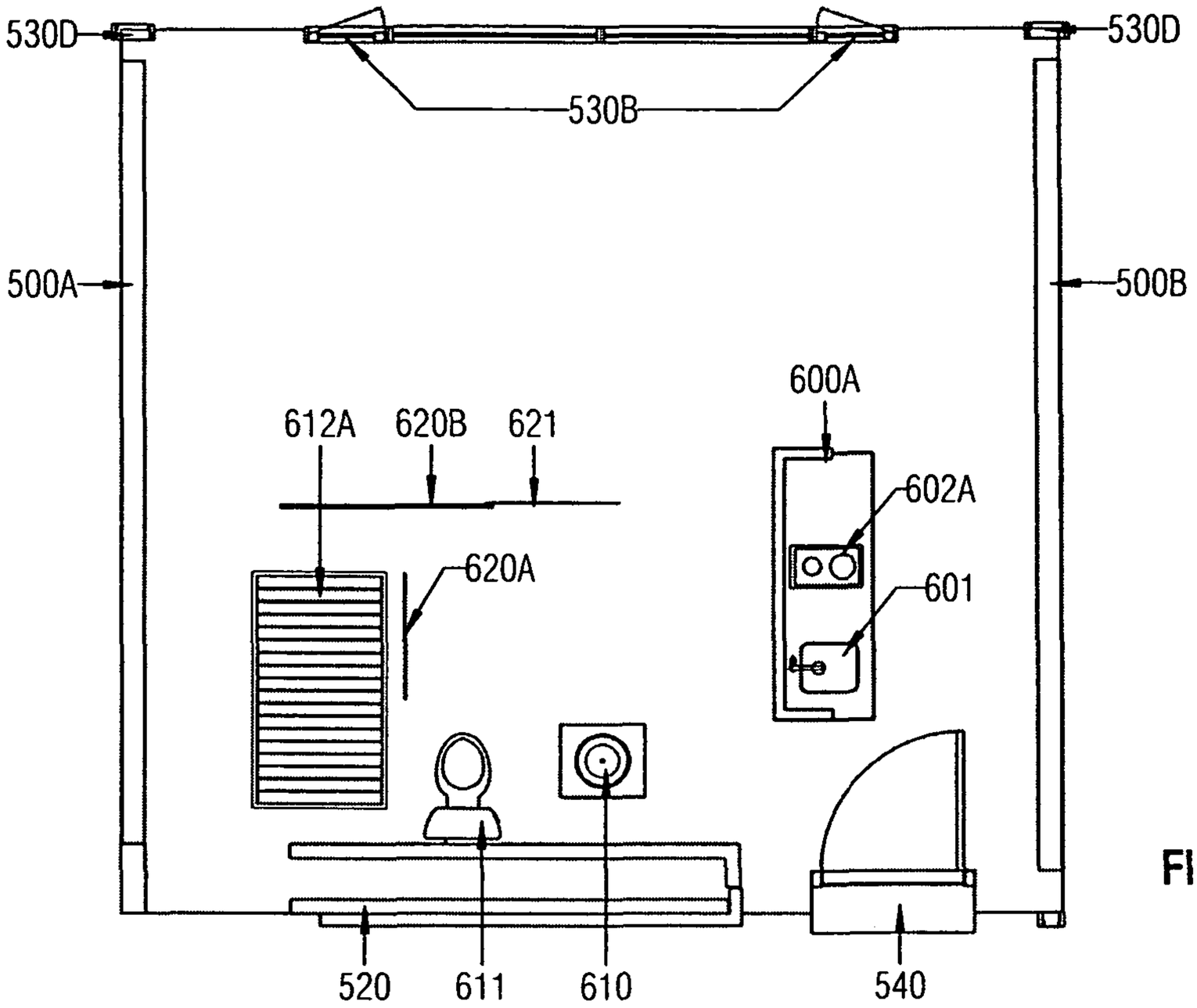

FIG. 10A

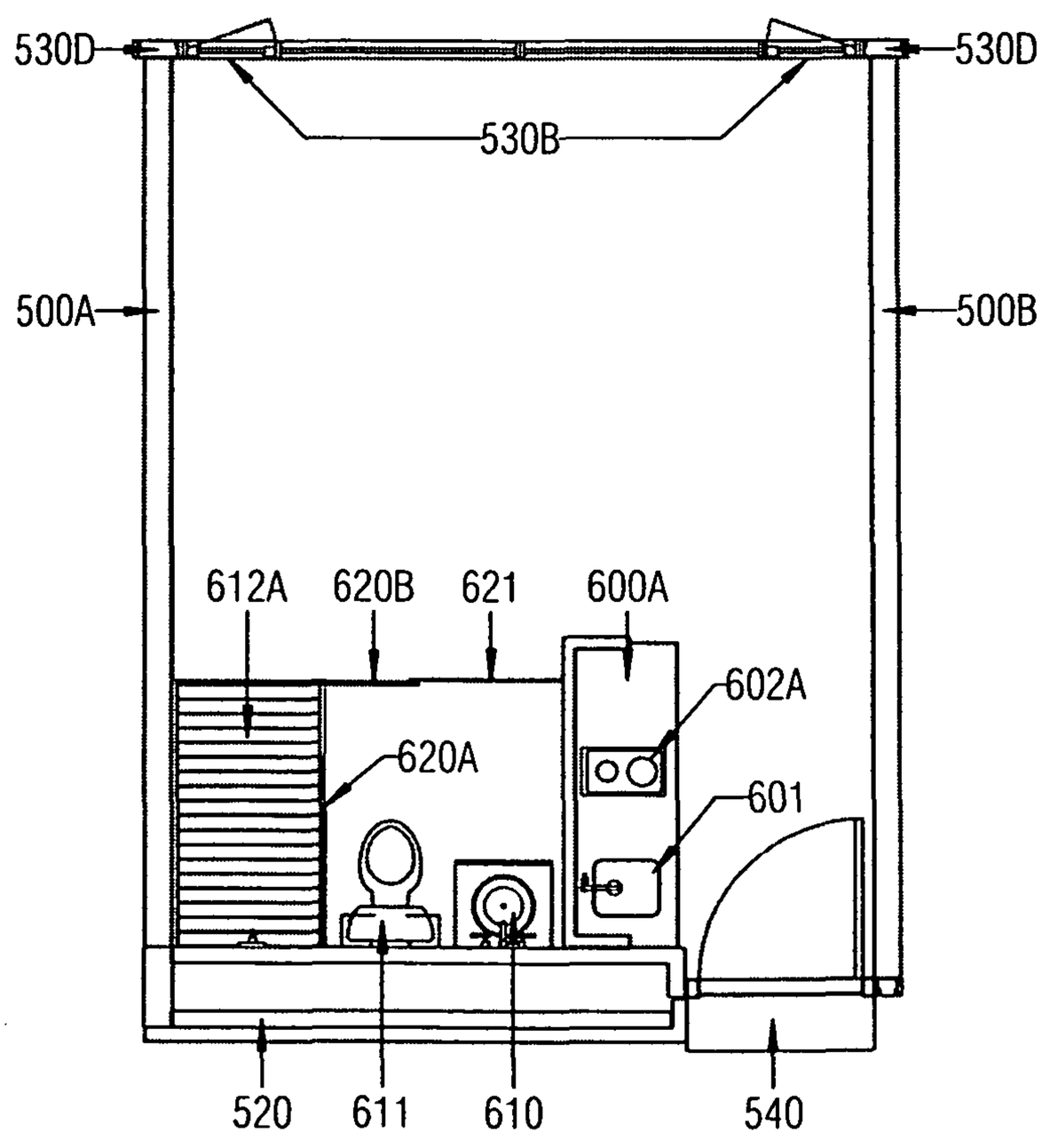

FIG. 10B

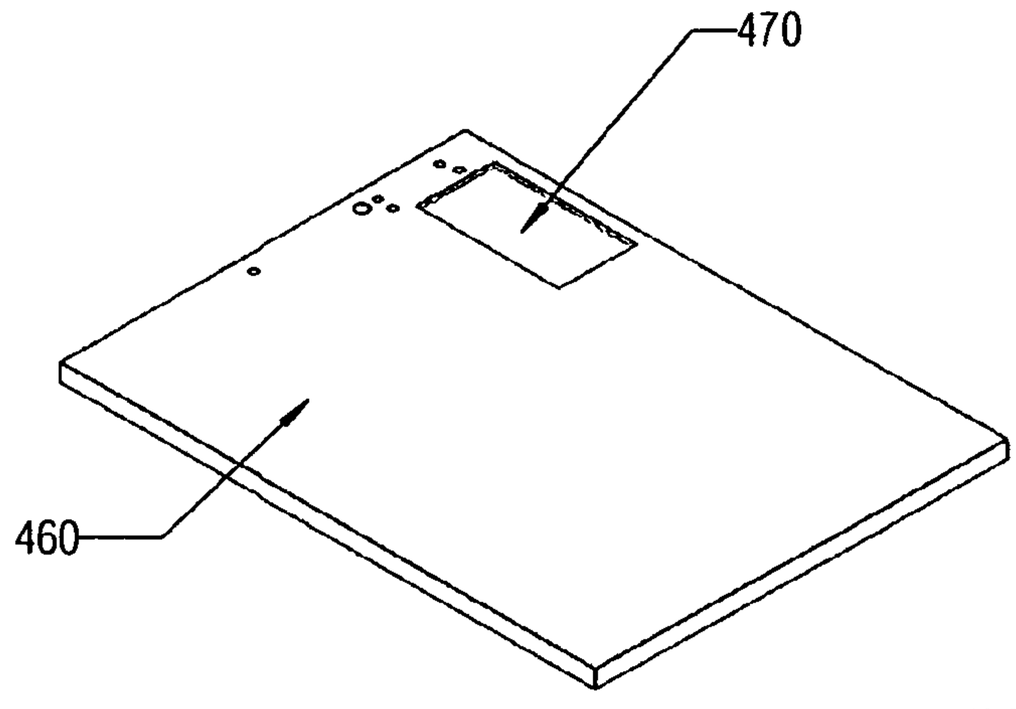

FIG. 11A

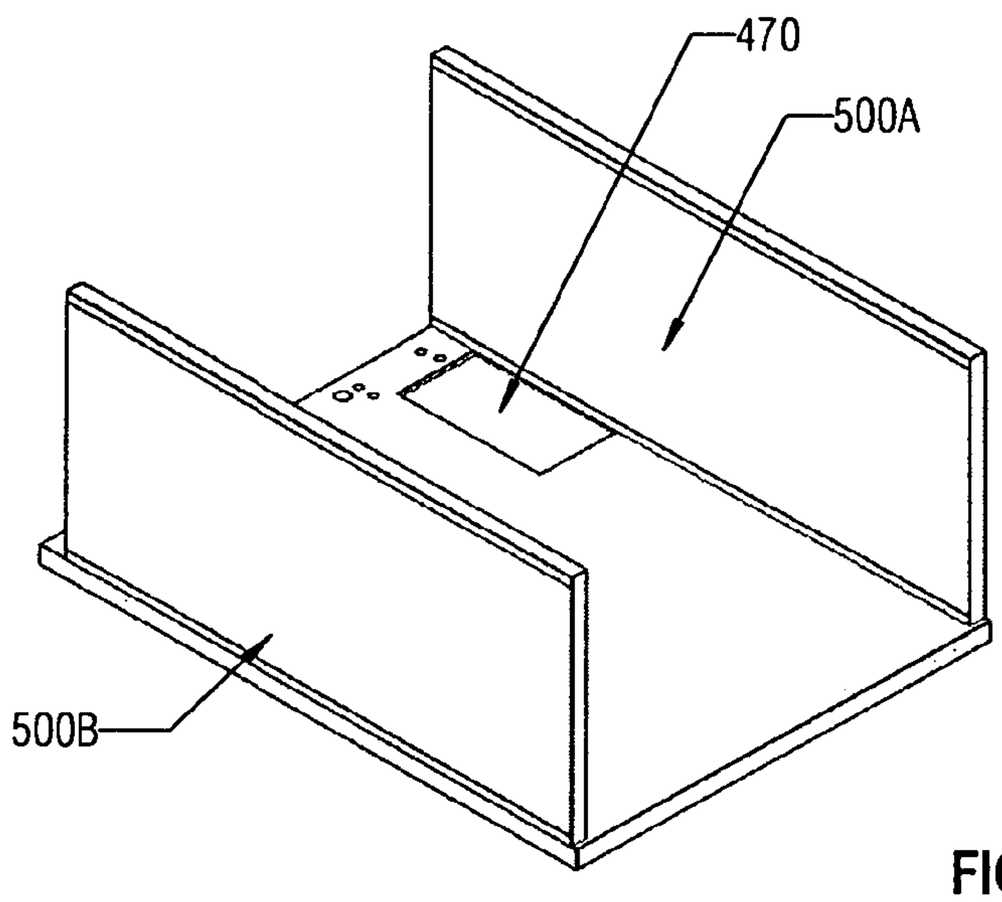

FIG. 11B

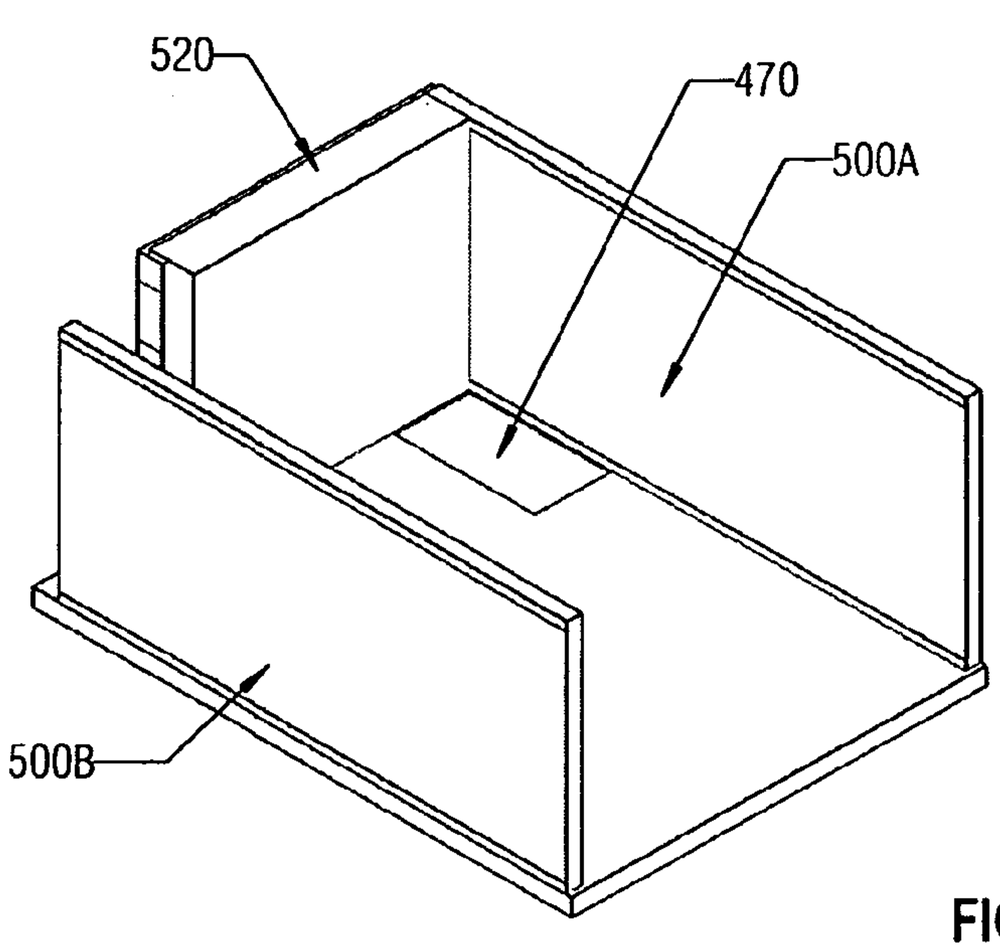

FIG. 11C

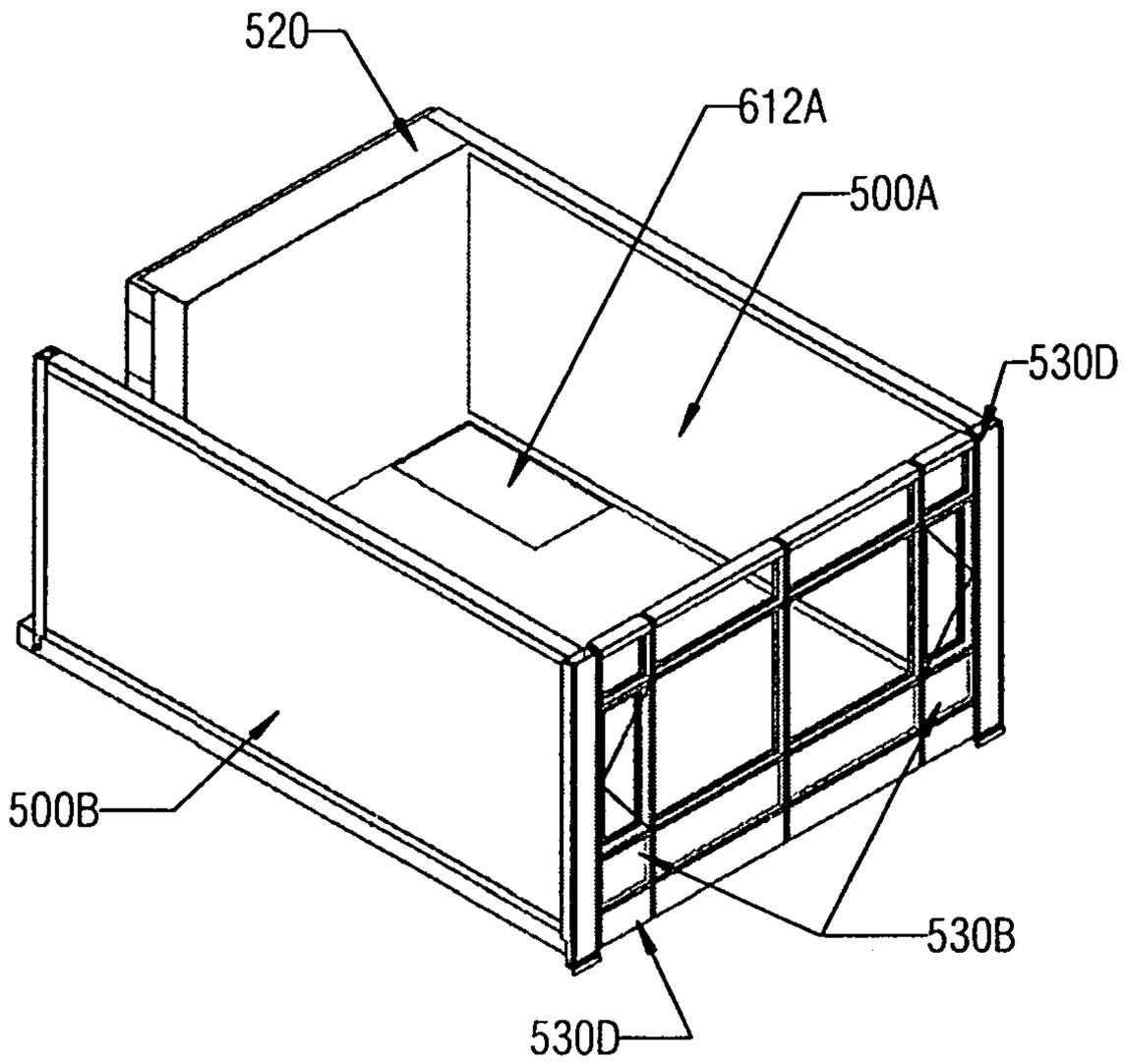

FIG. 11D

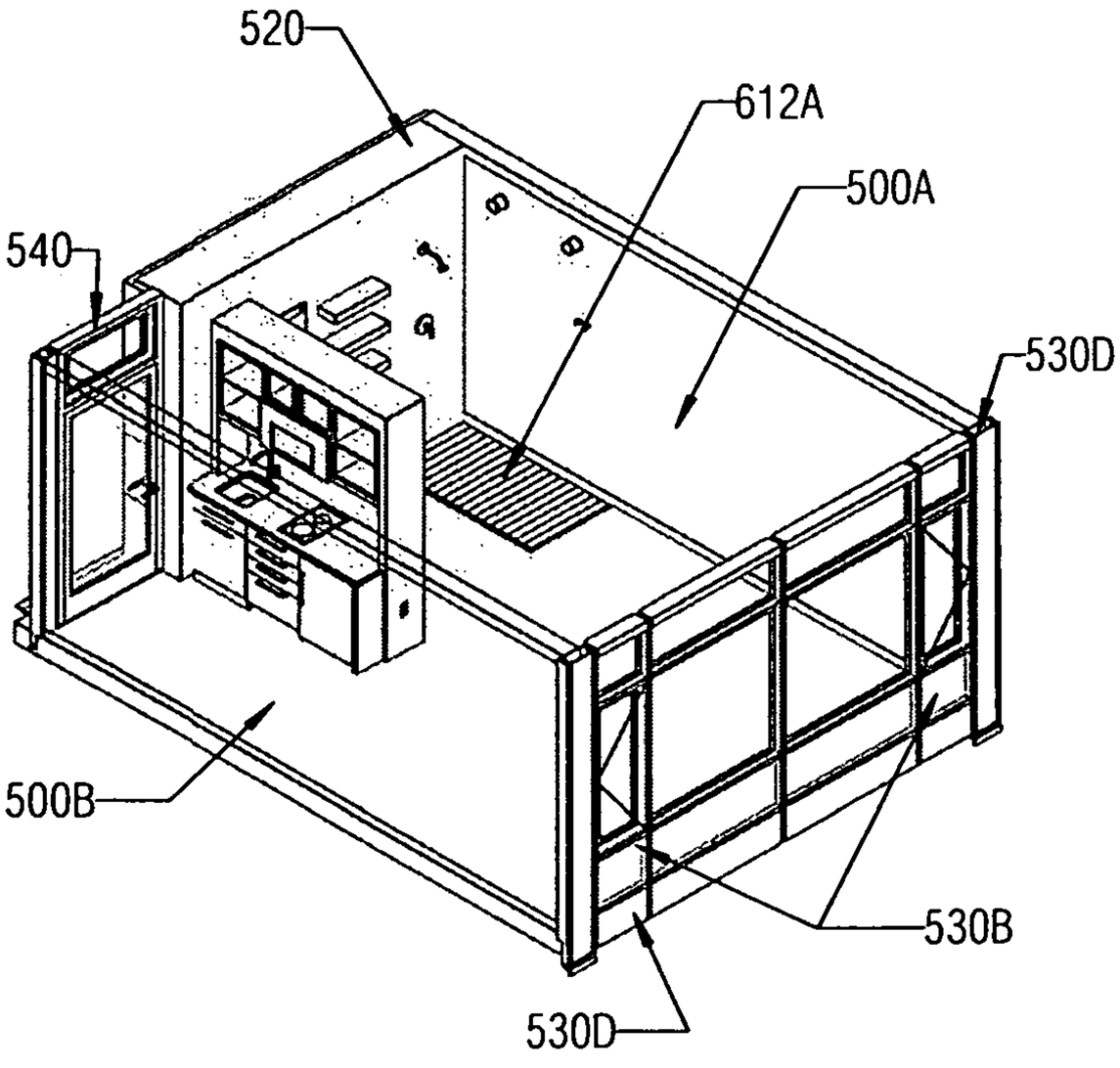

FIG. 11E

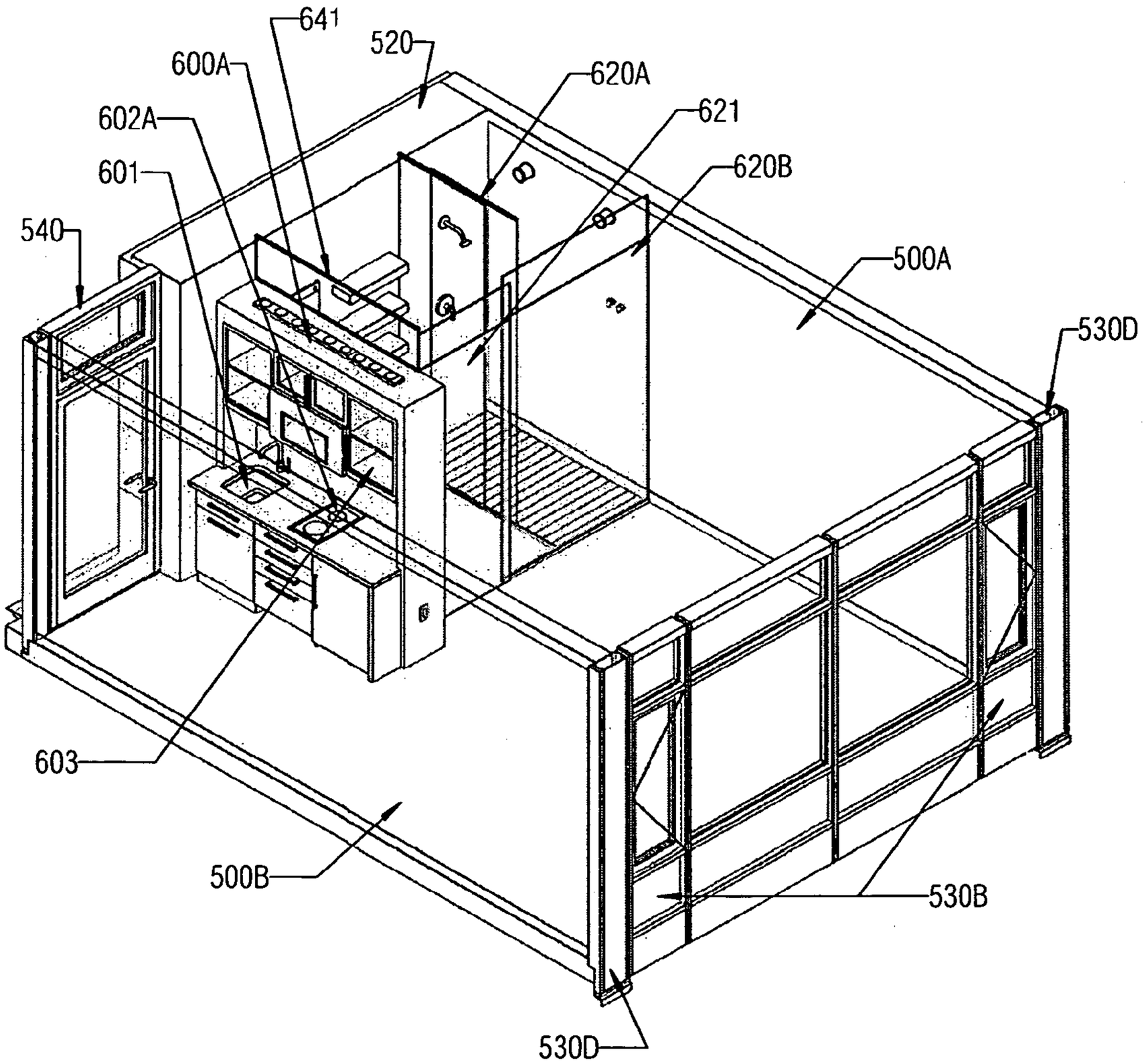
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FIG. 11F

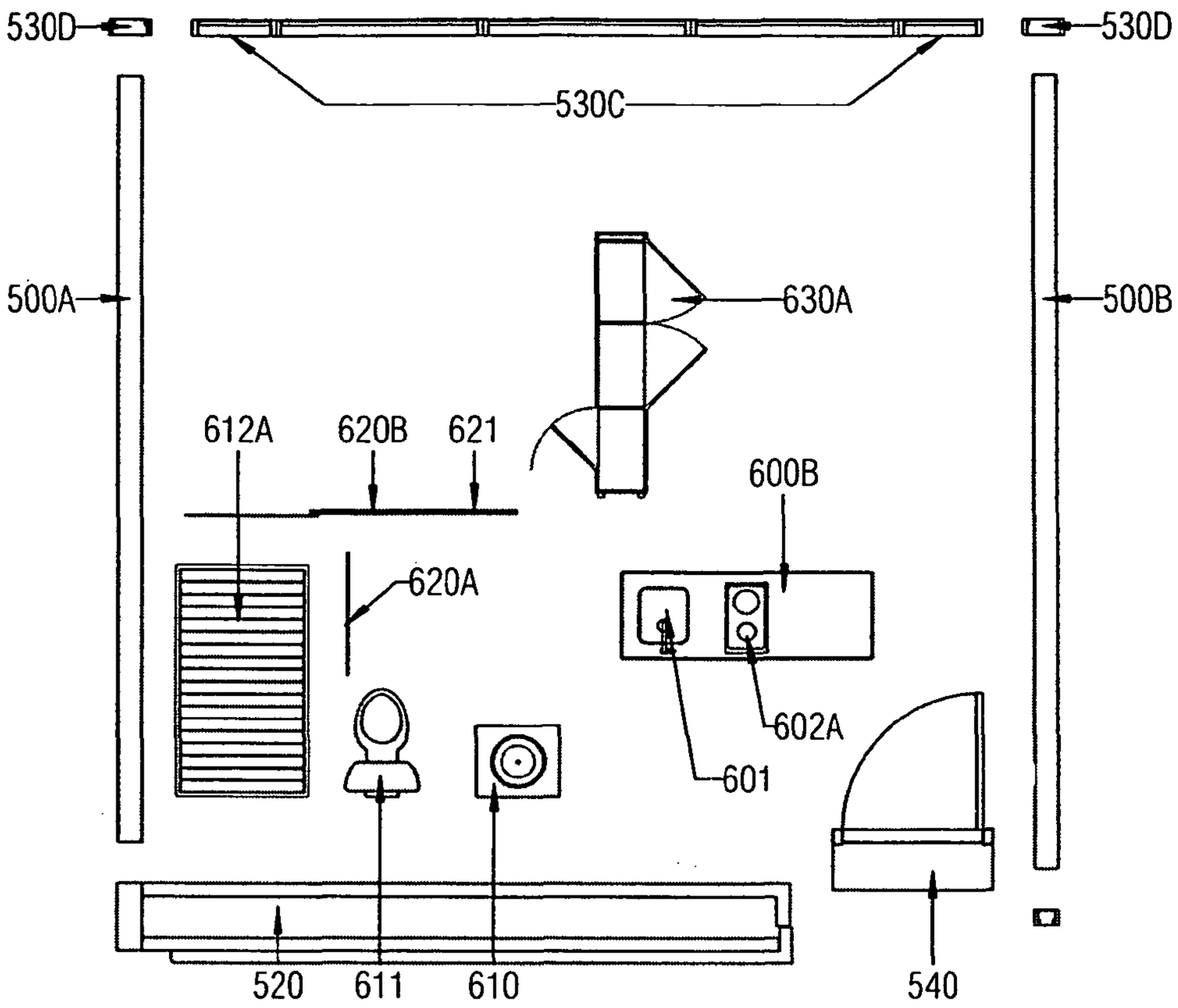

FIG. 12A

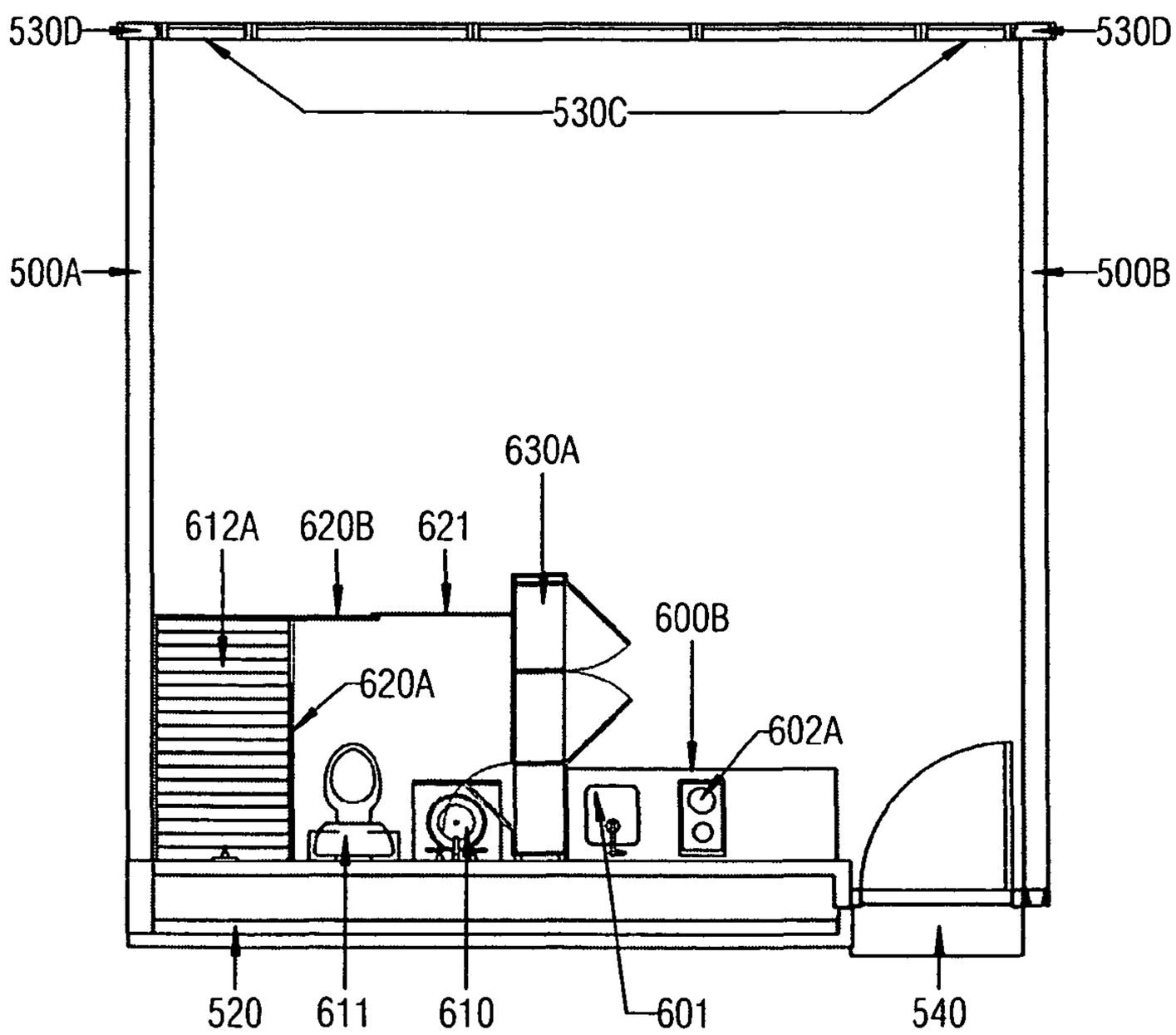

FIG. 12B

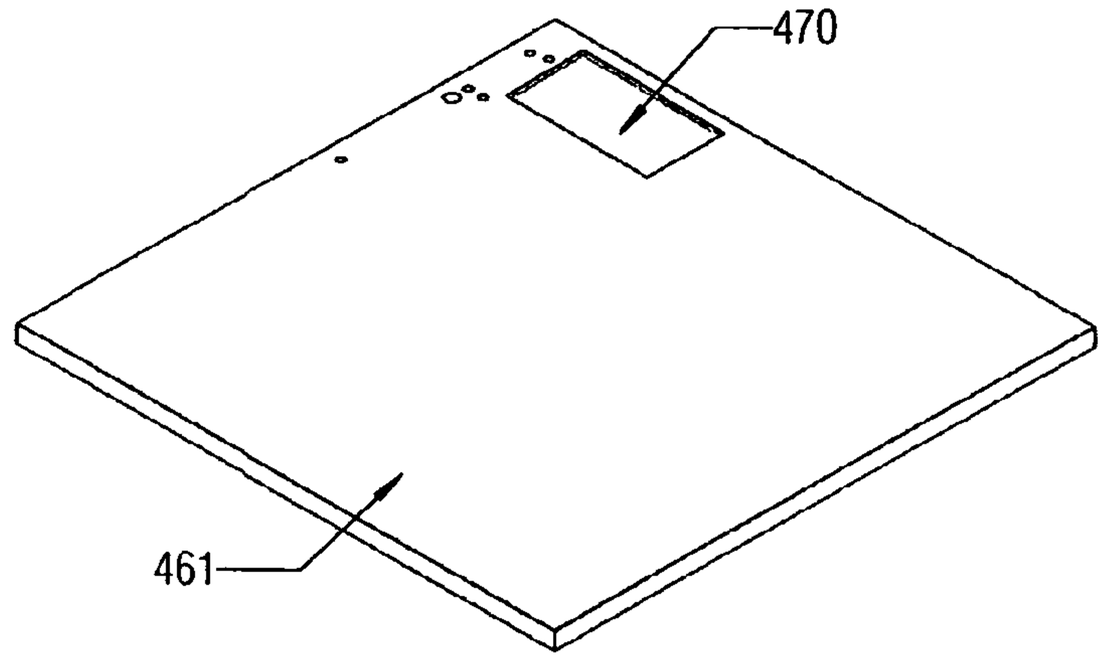

FIG. 13A

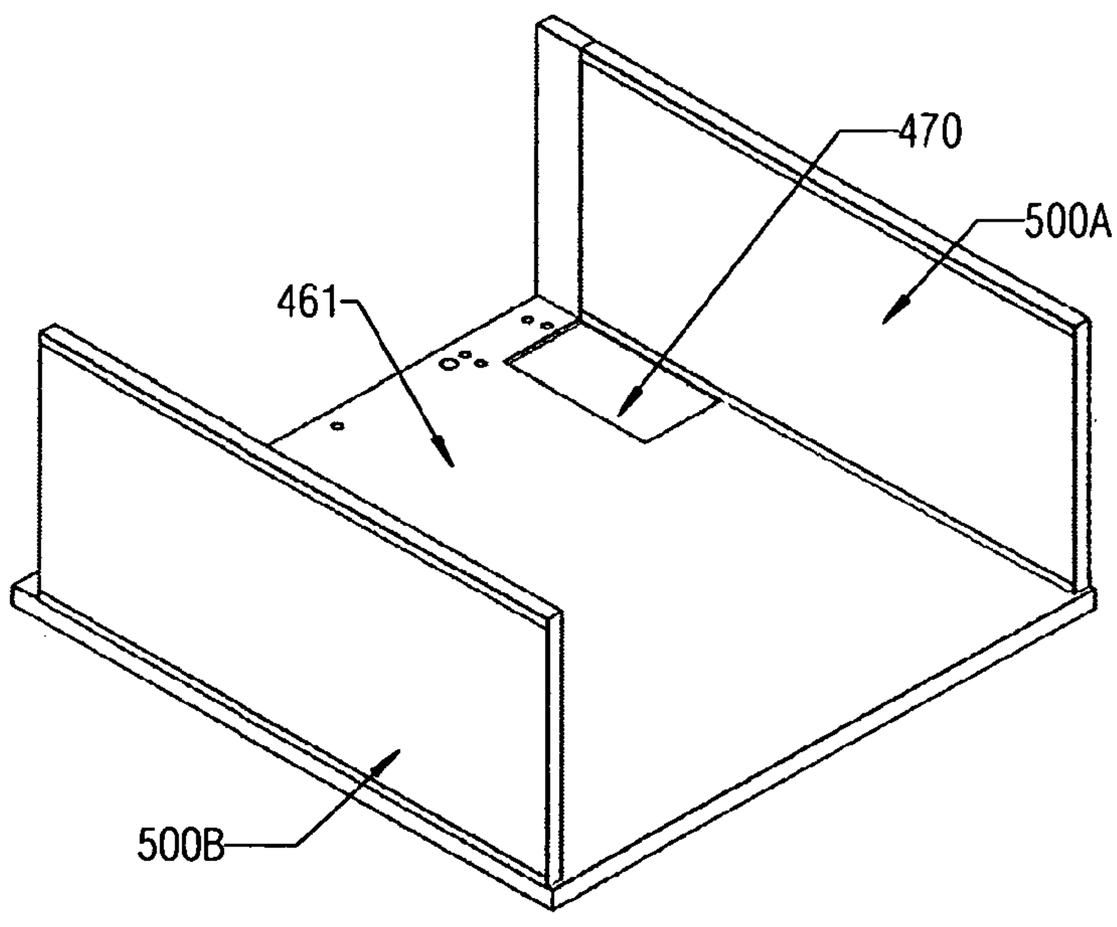

FIG. 13B

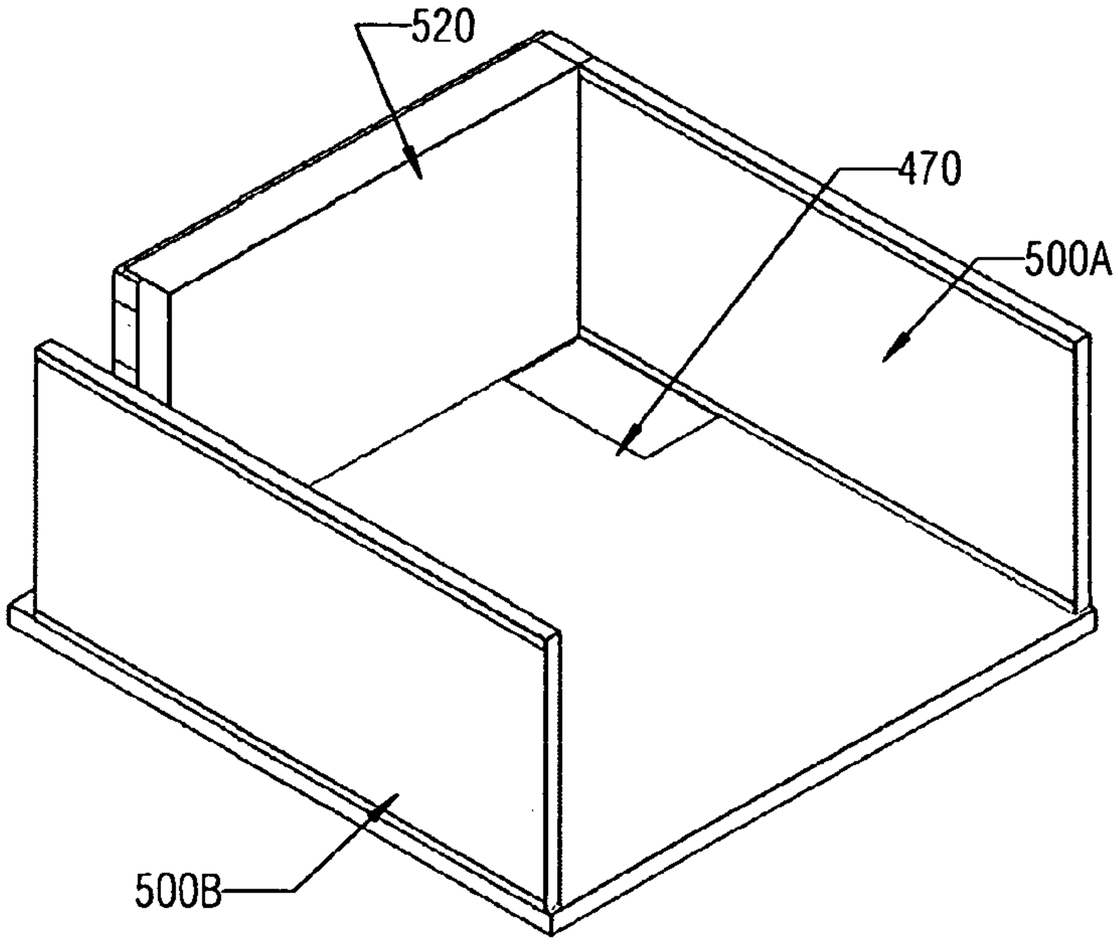

FIG. 13C

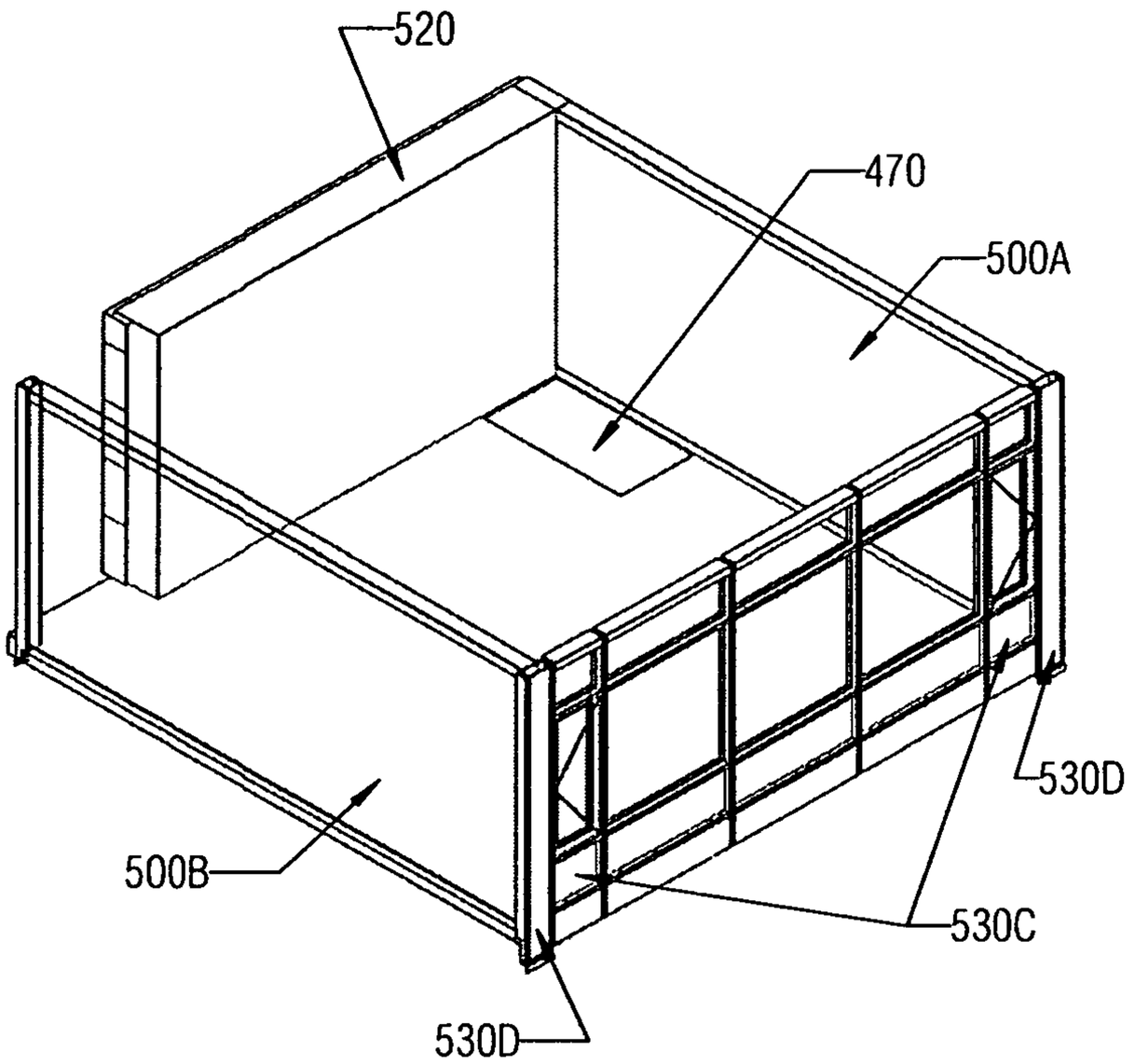

FIG. 13D

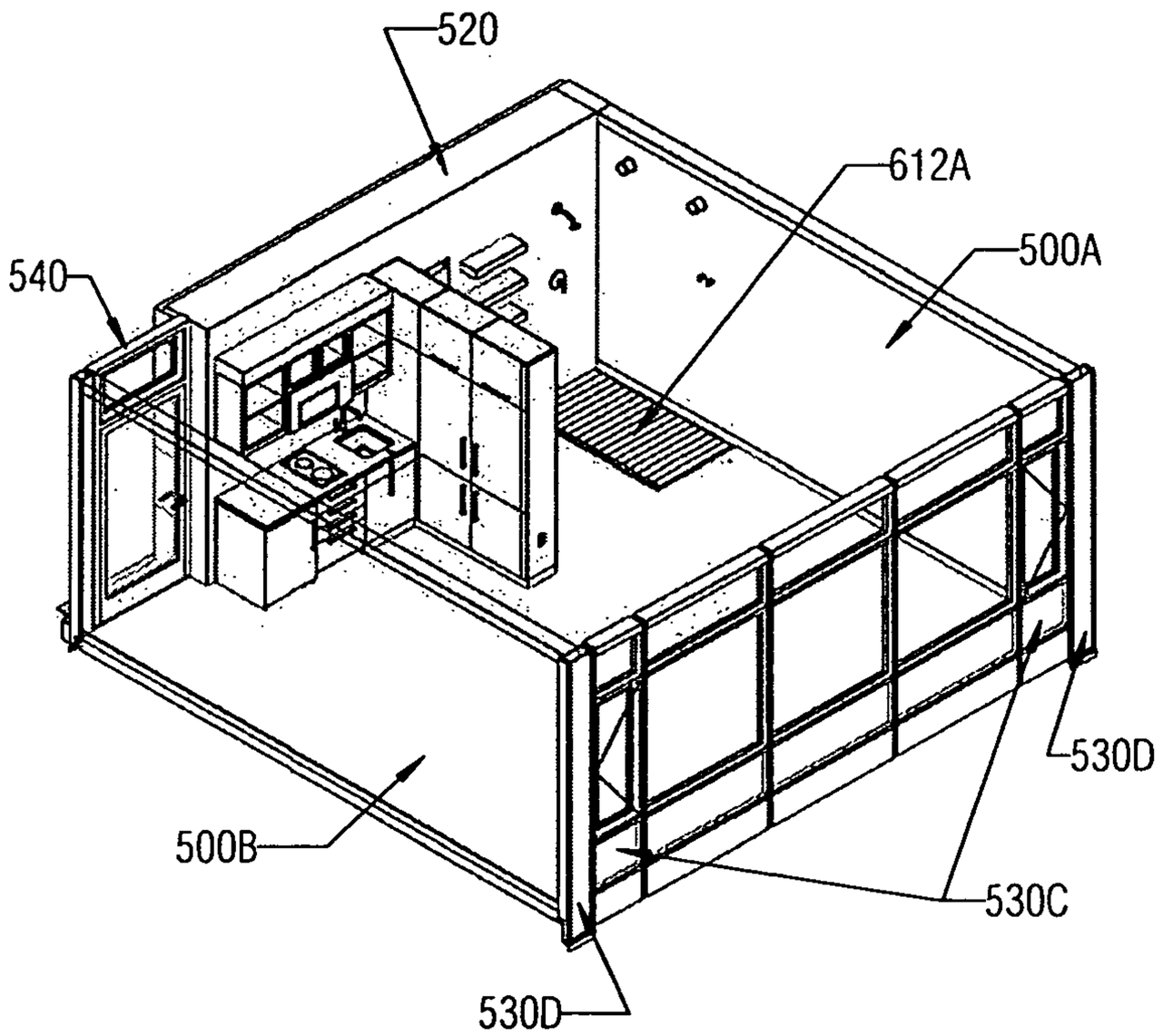

FIG. 13E

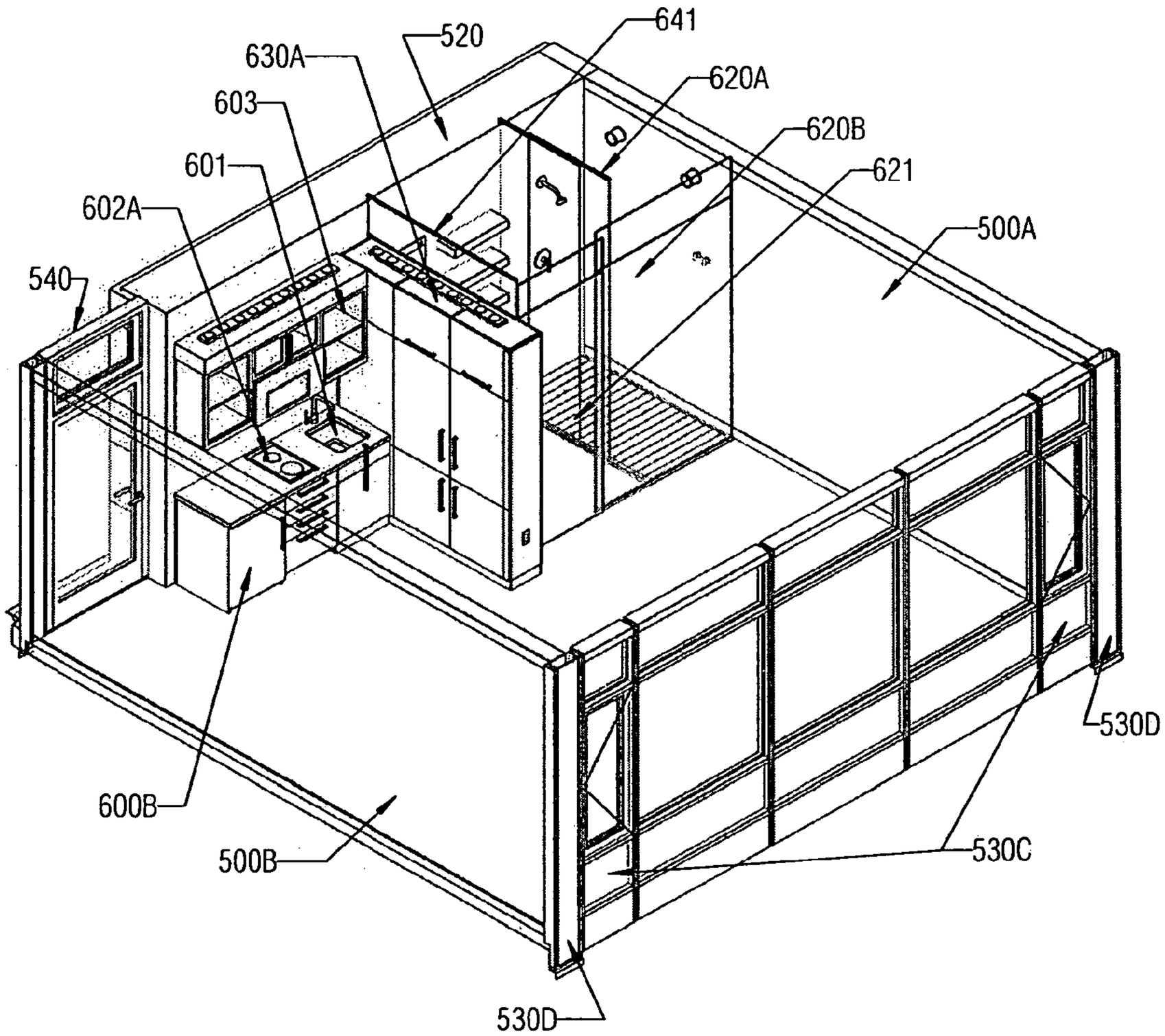
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FIG. 13F

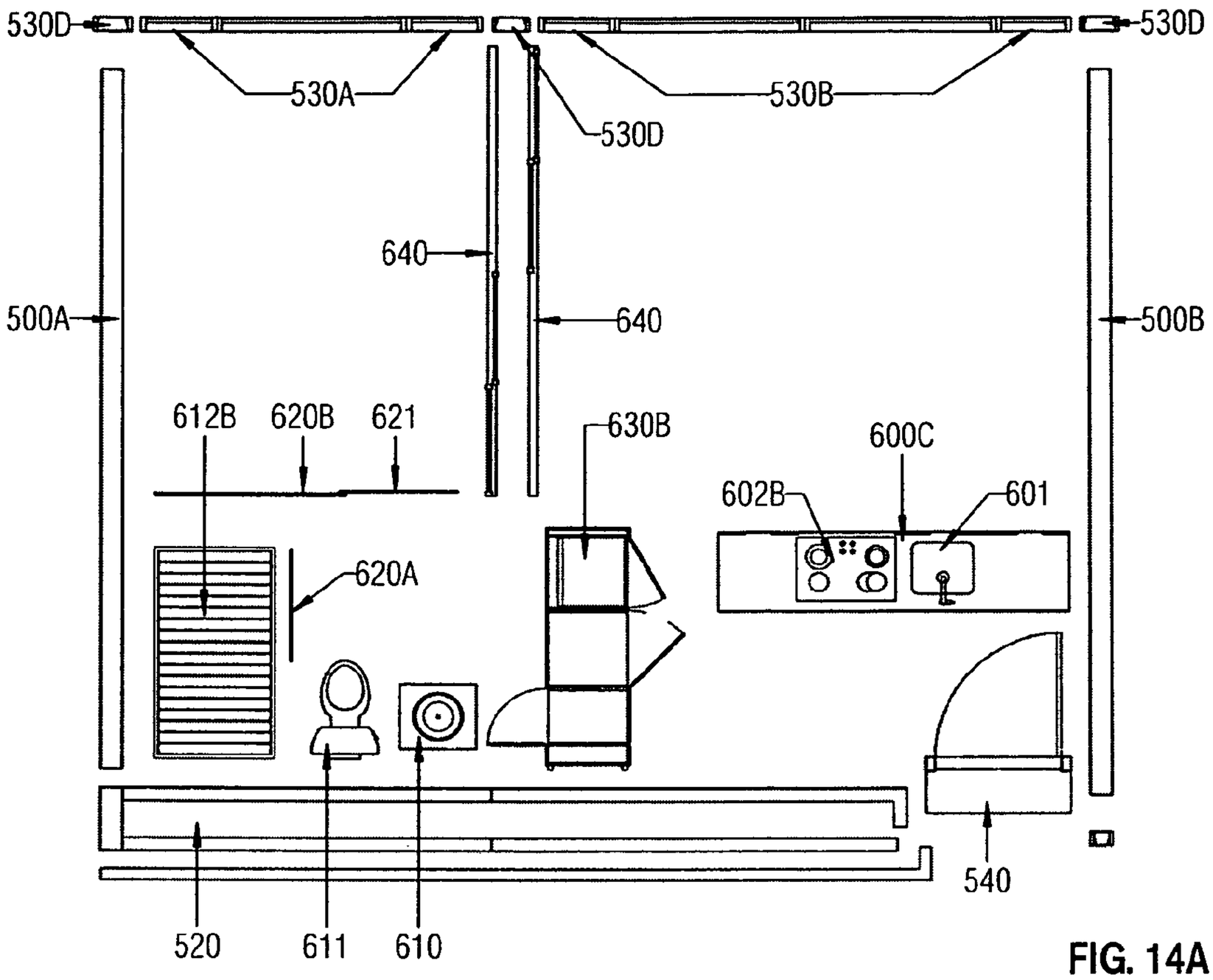

FIG. 14A

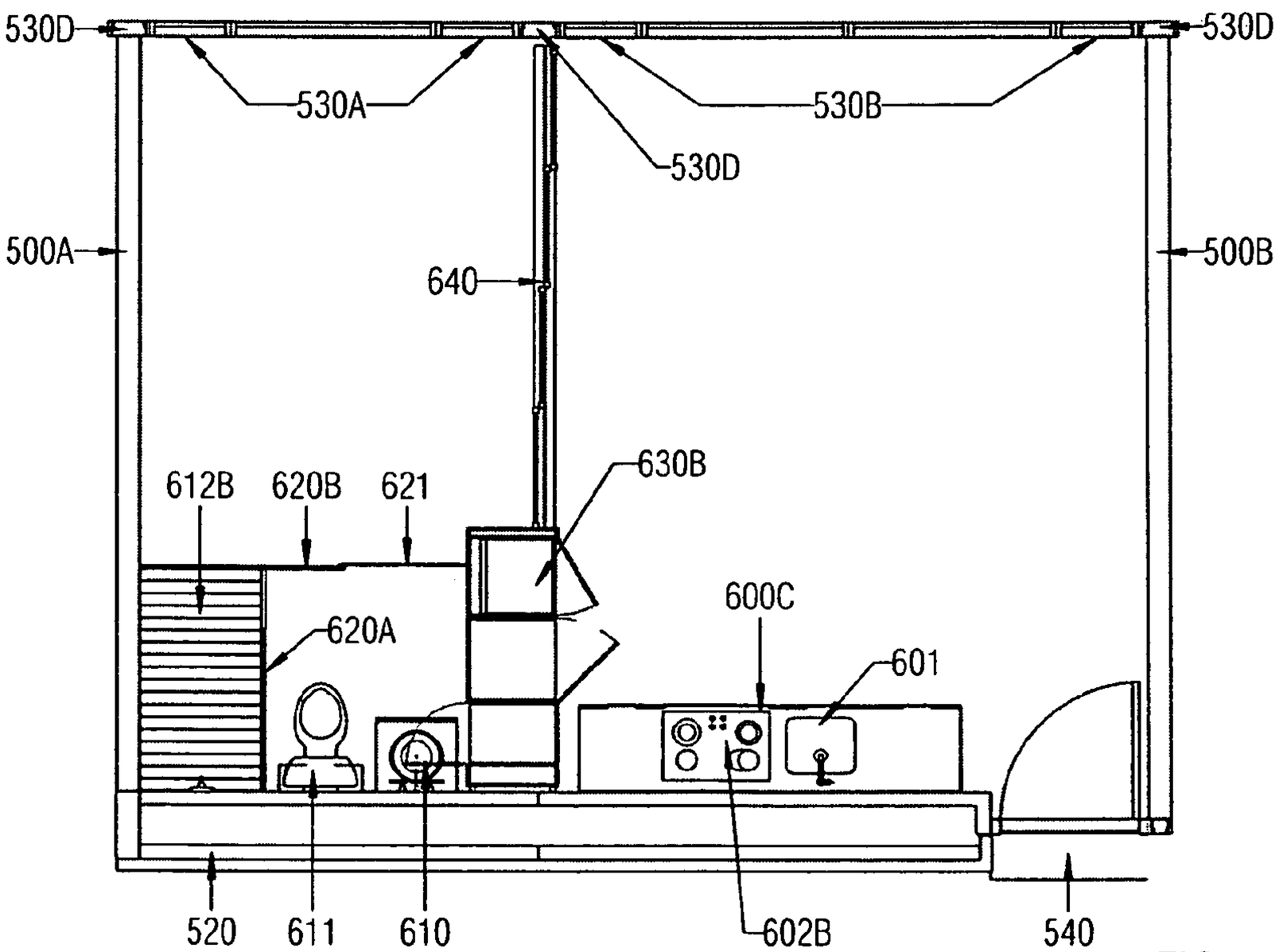

FIG. 14B

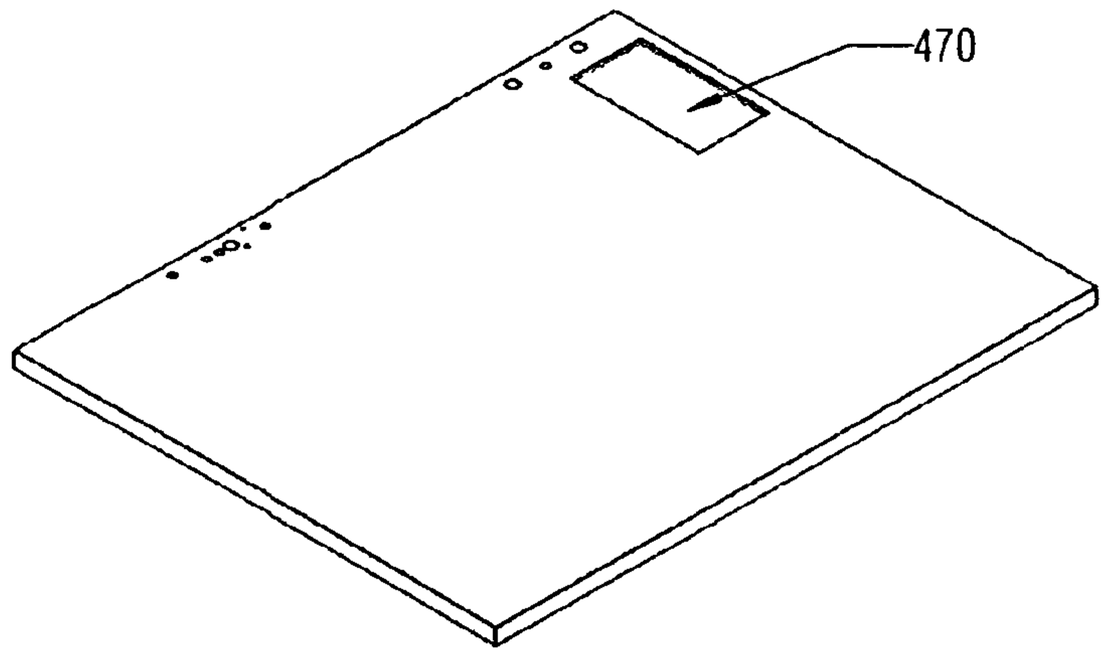

FIG. 15A

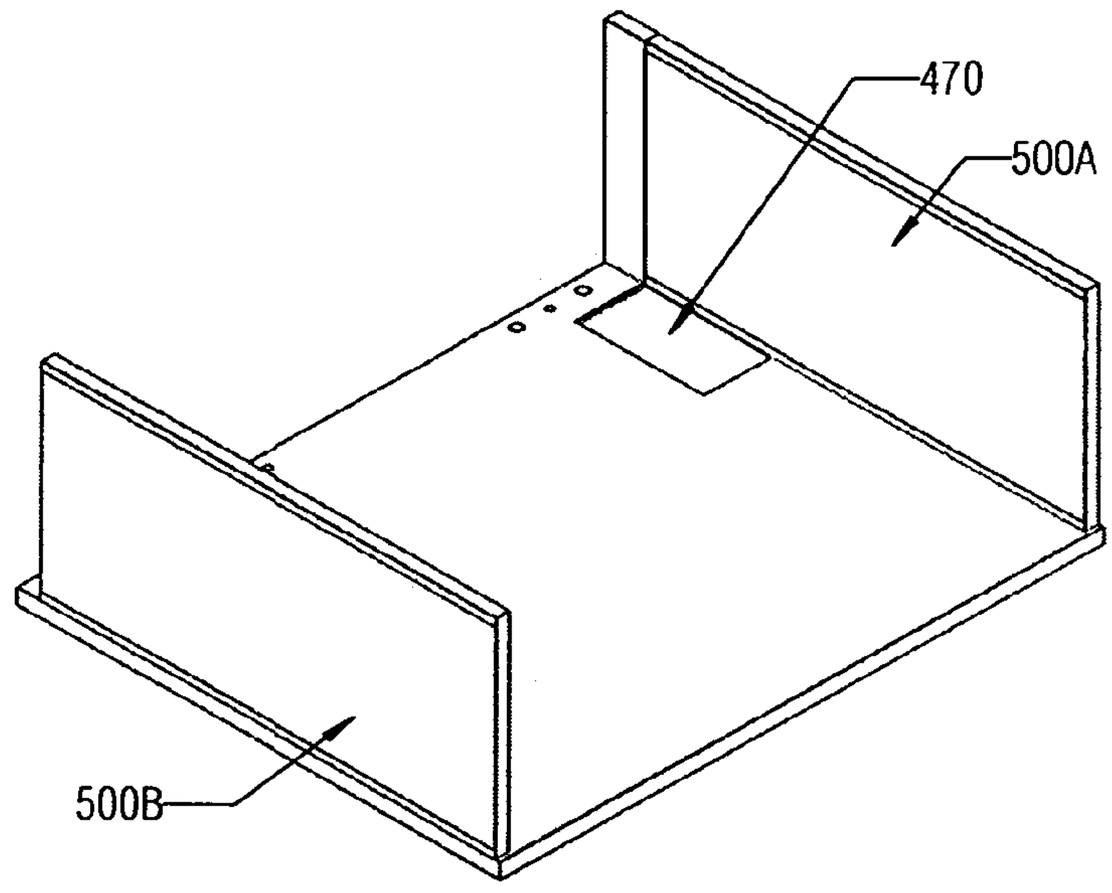

FIG. 15B

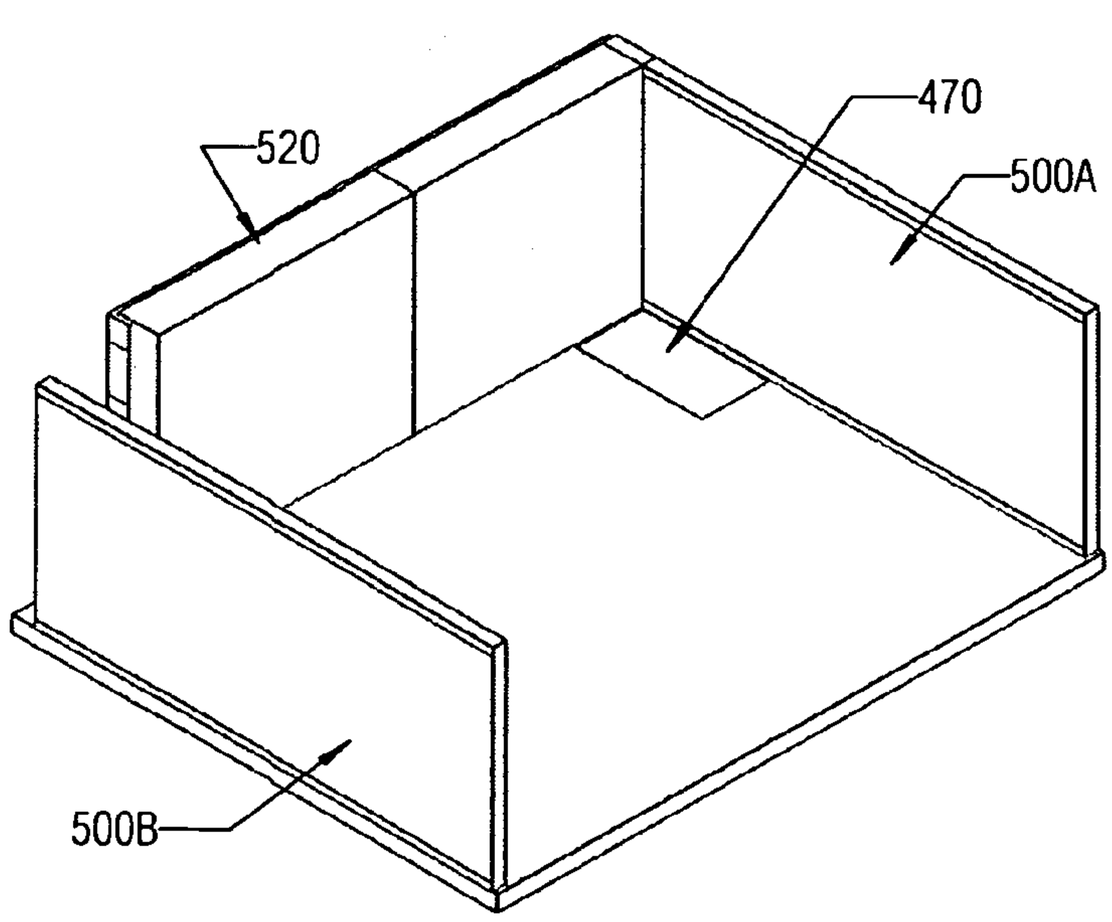

FIG. 15C

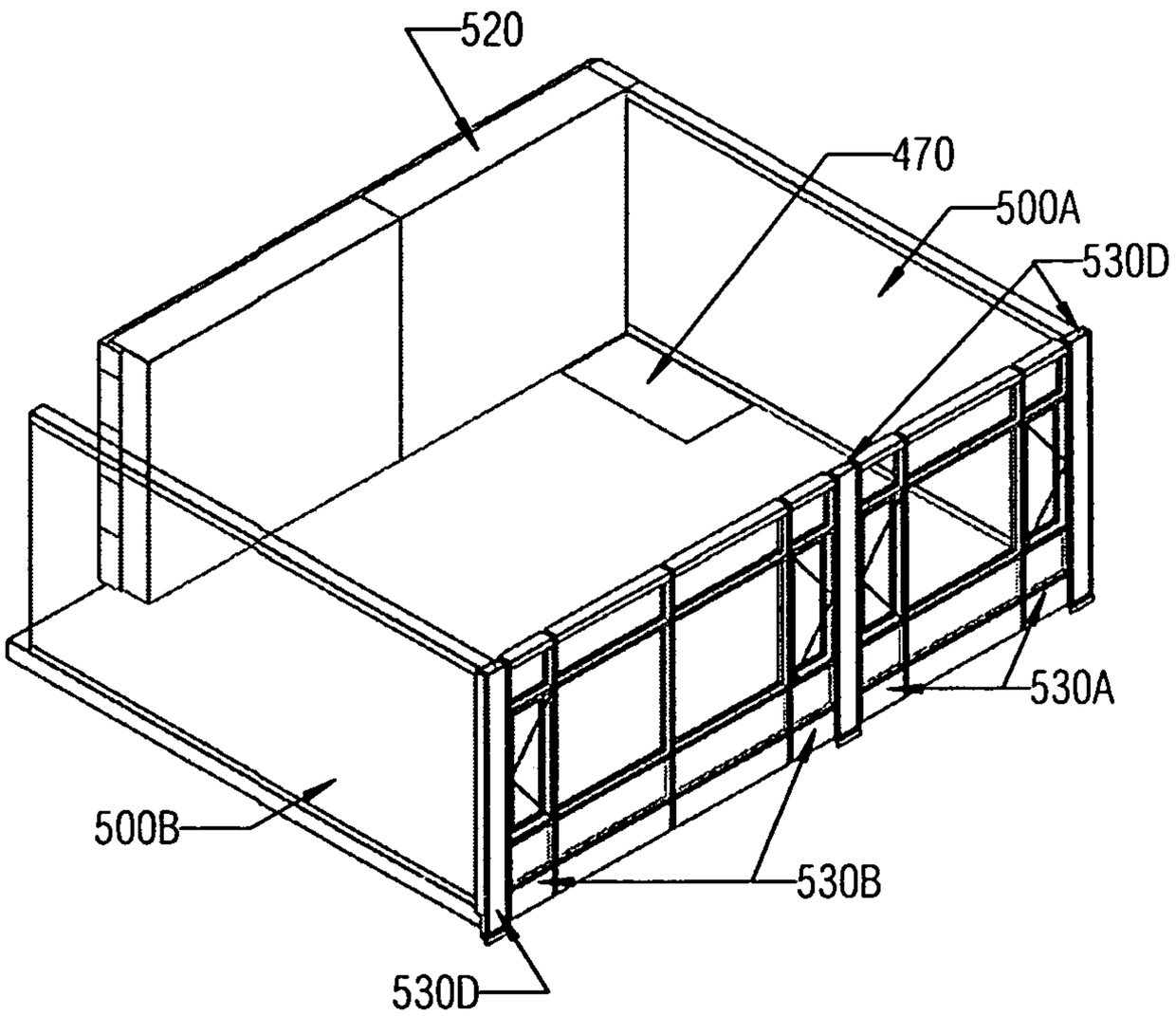

FIG. 15D

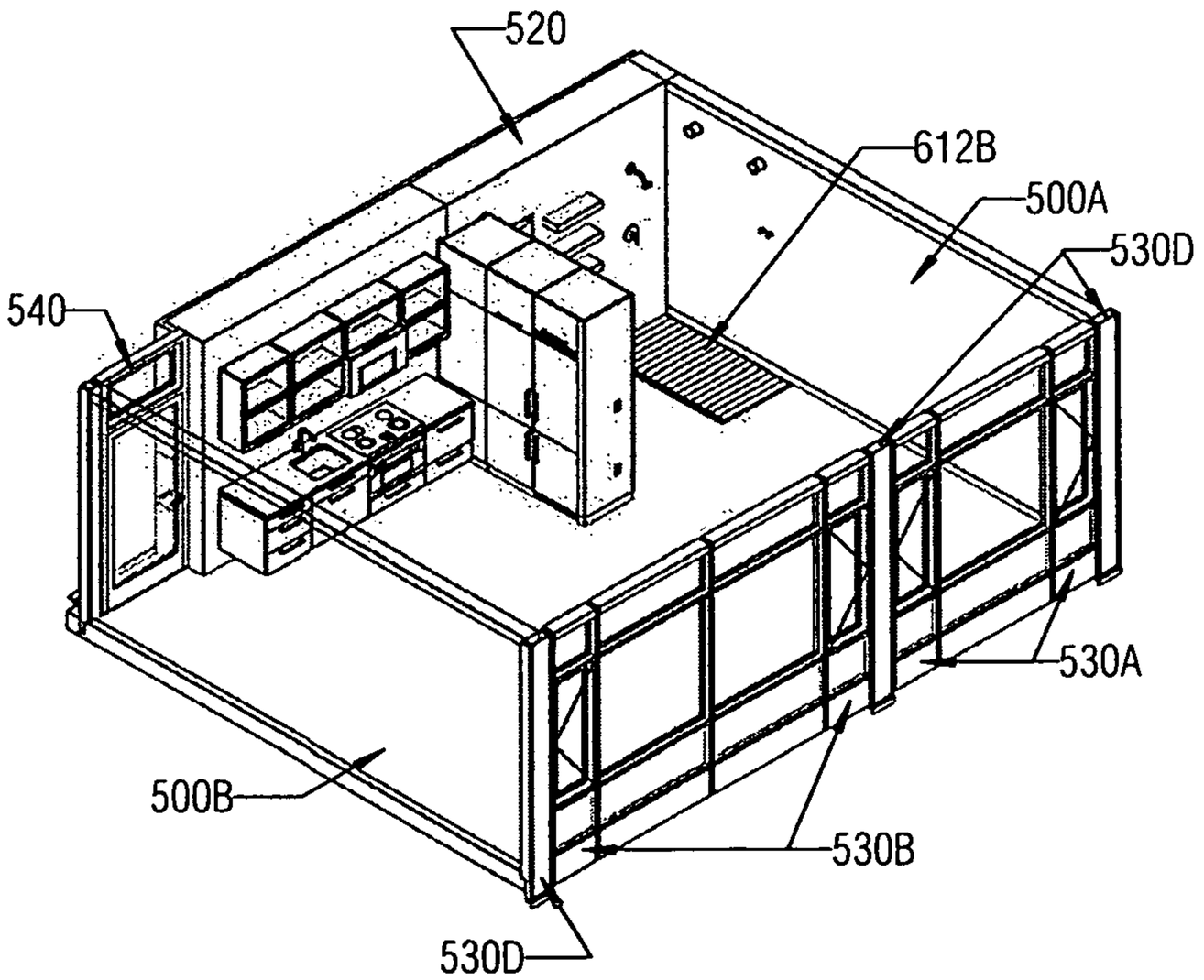

FIG. 15E

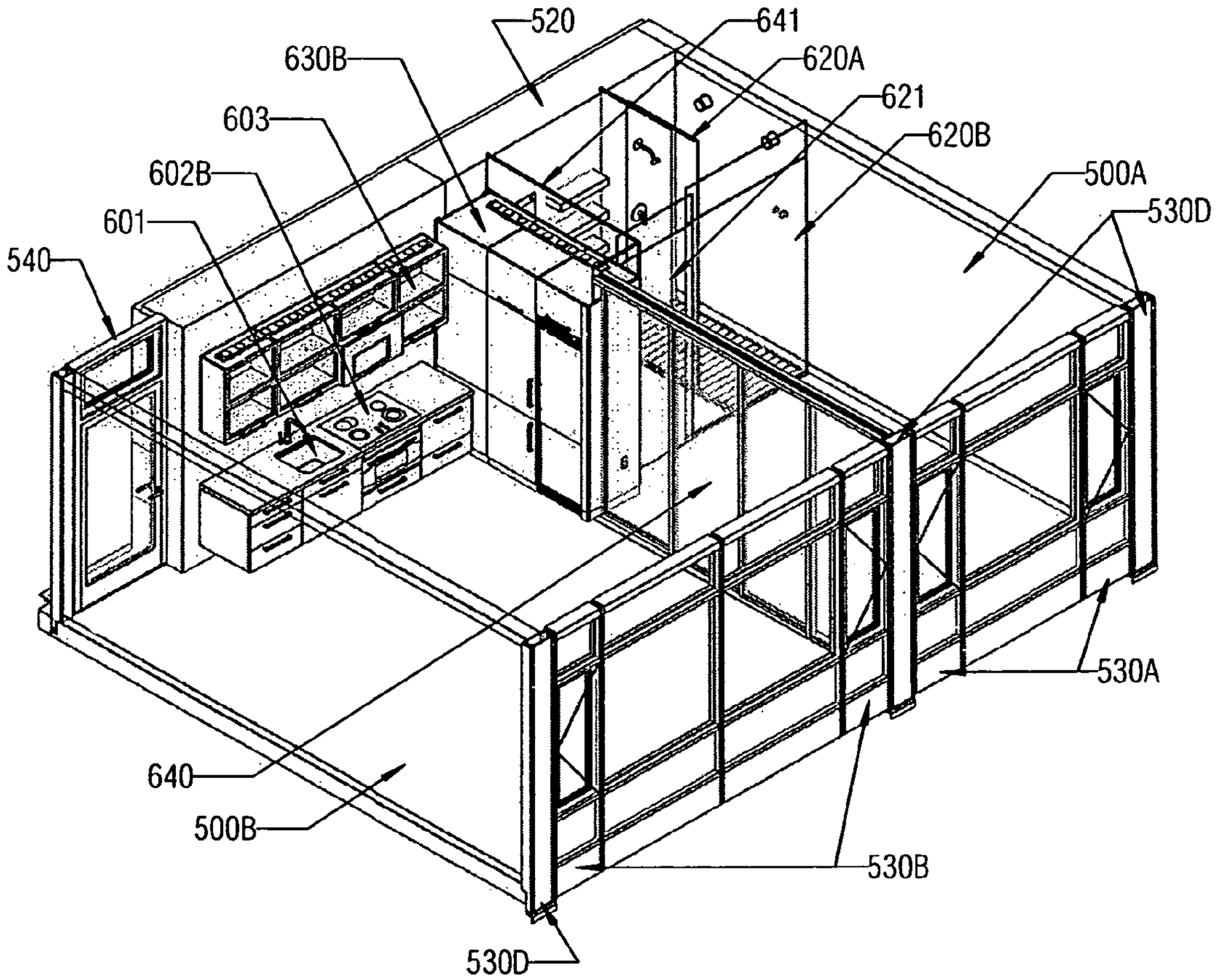
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FIG. 15F

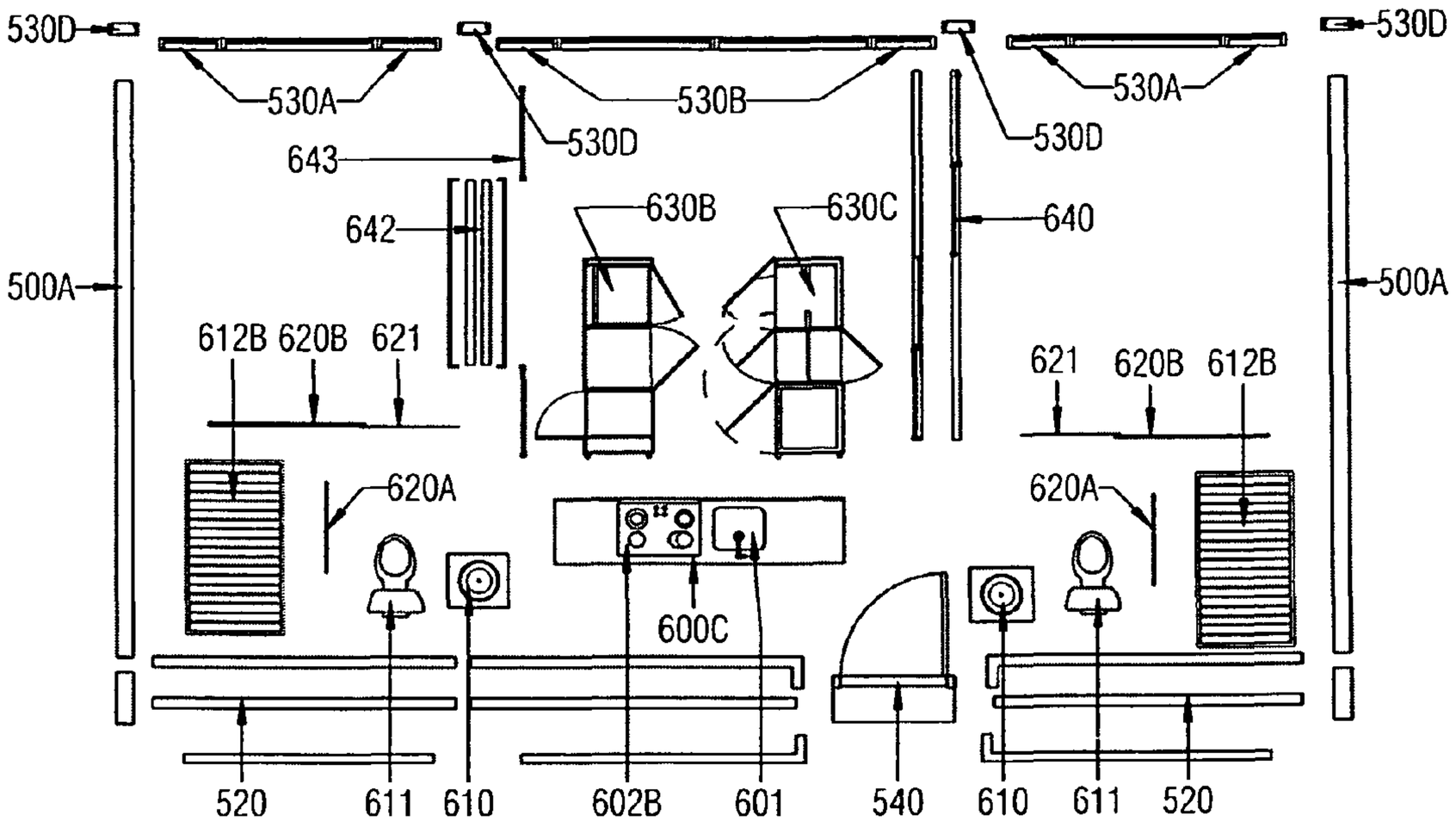

FIG. 16A

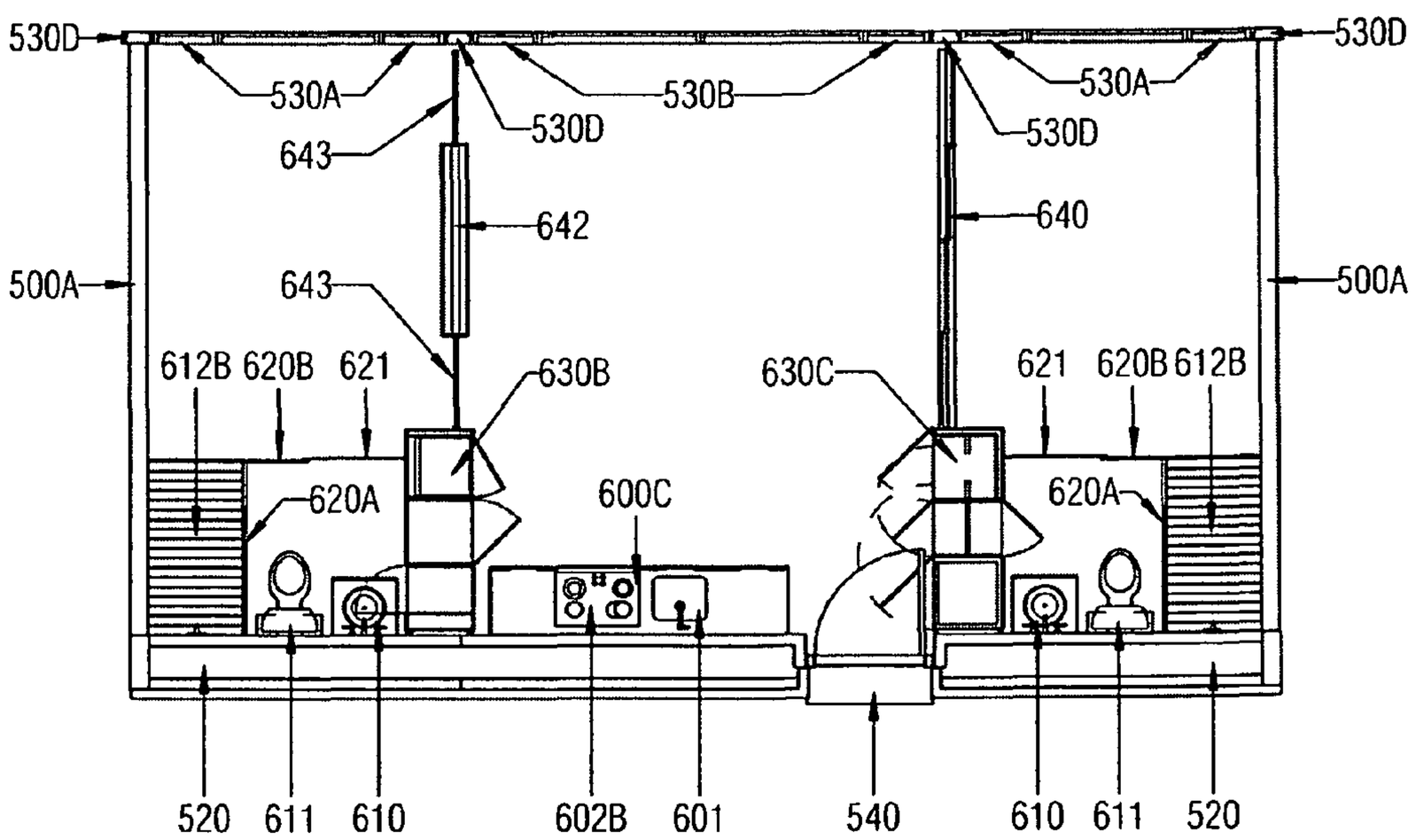

FIG. 16B

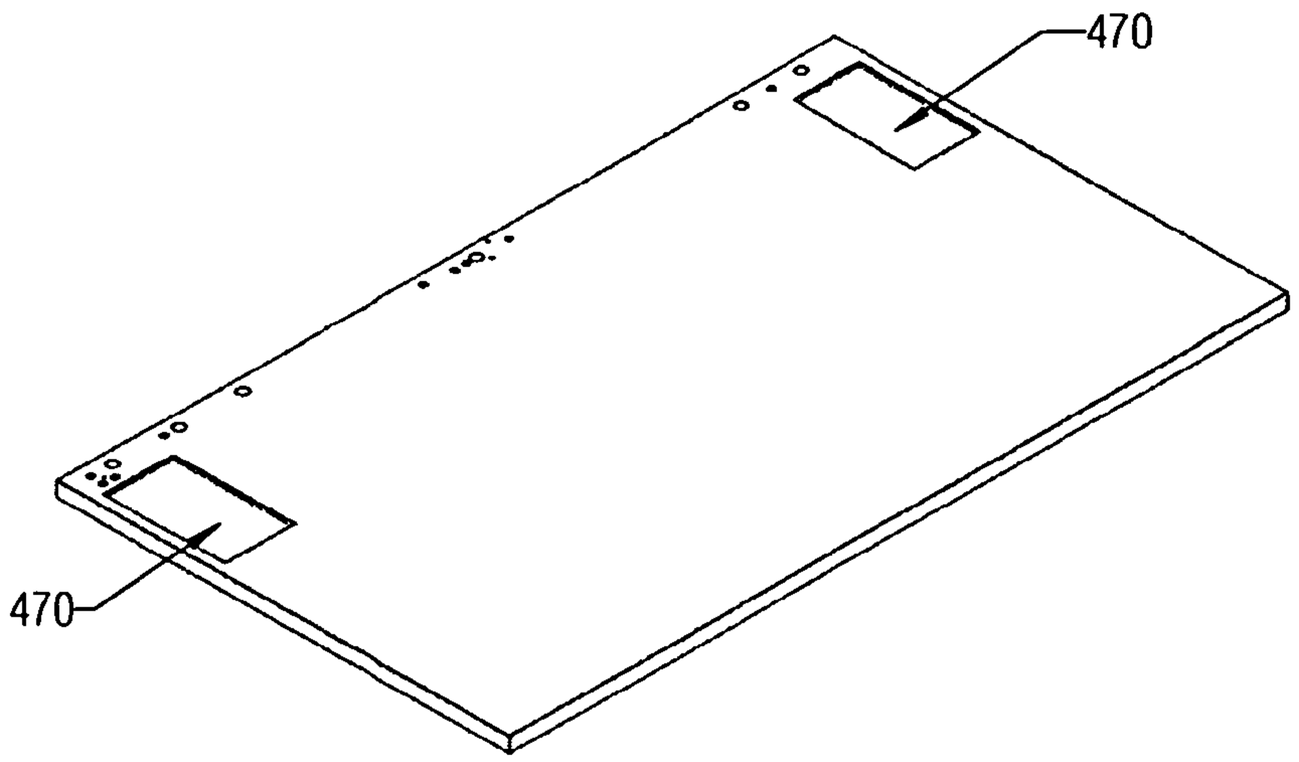

FIG. 17A

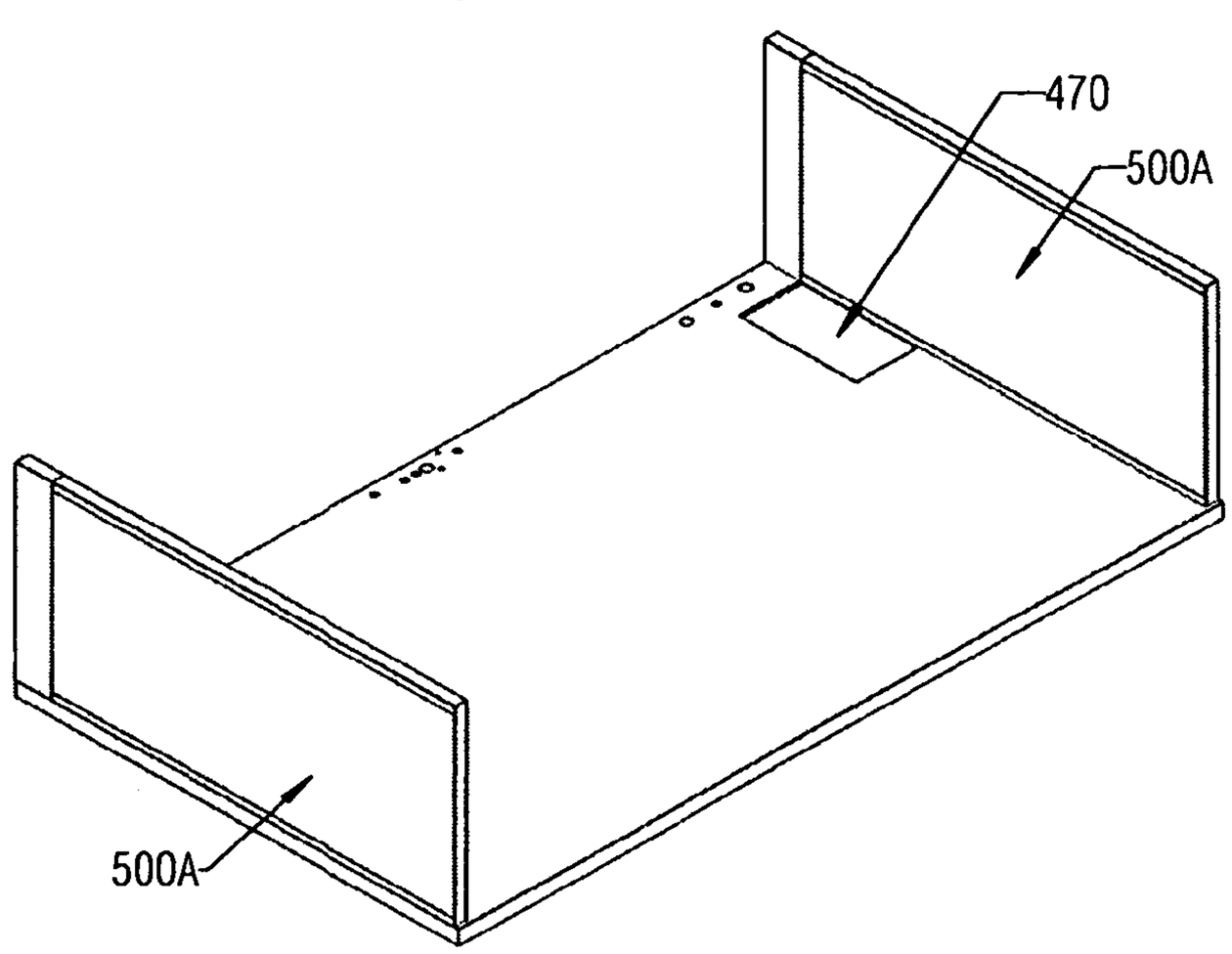

FIG. 17B

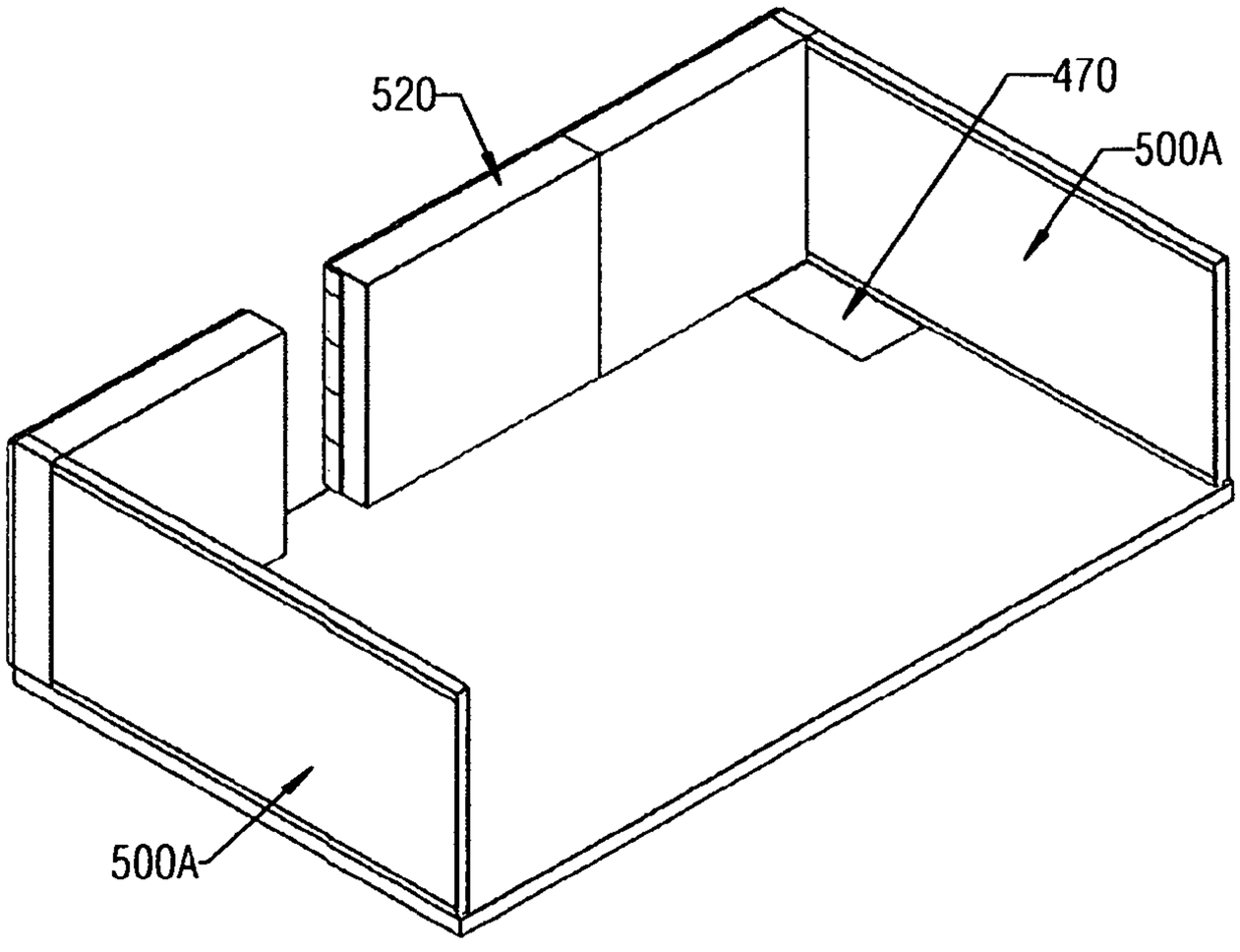

FIG. 17C

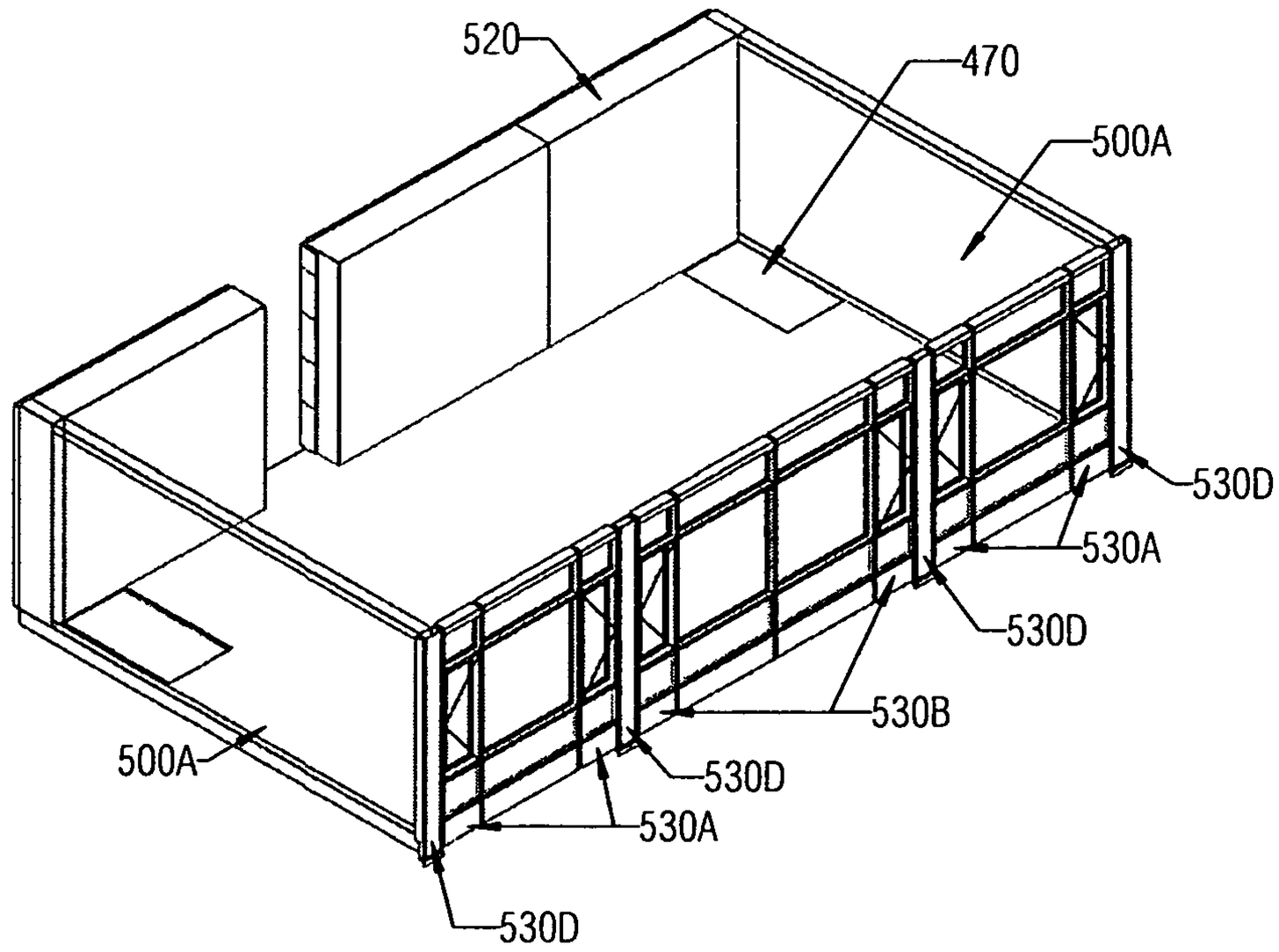

FIG. 17D

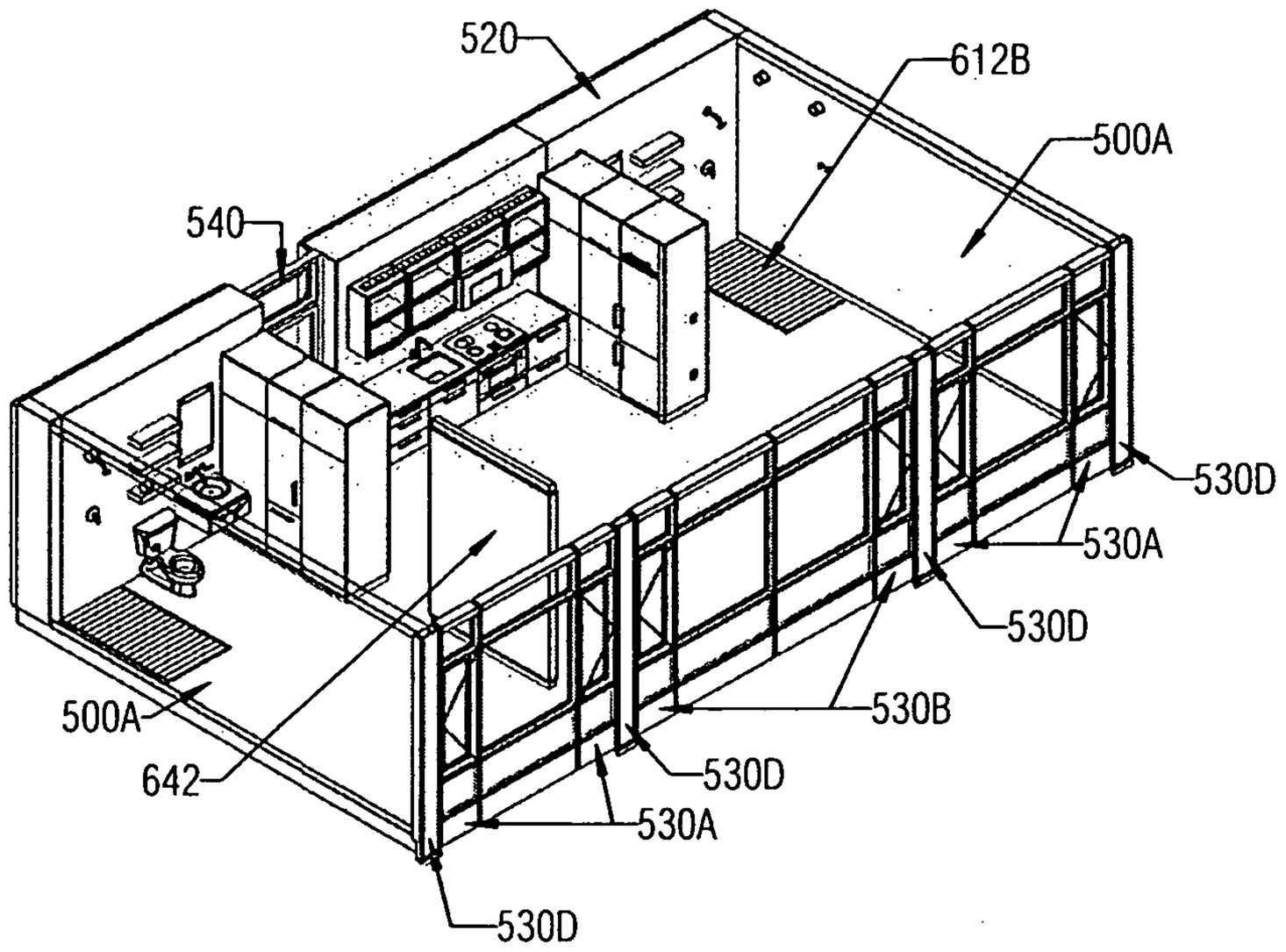

FIG. 17E

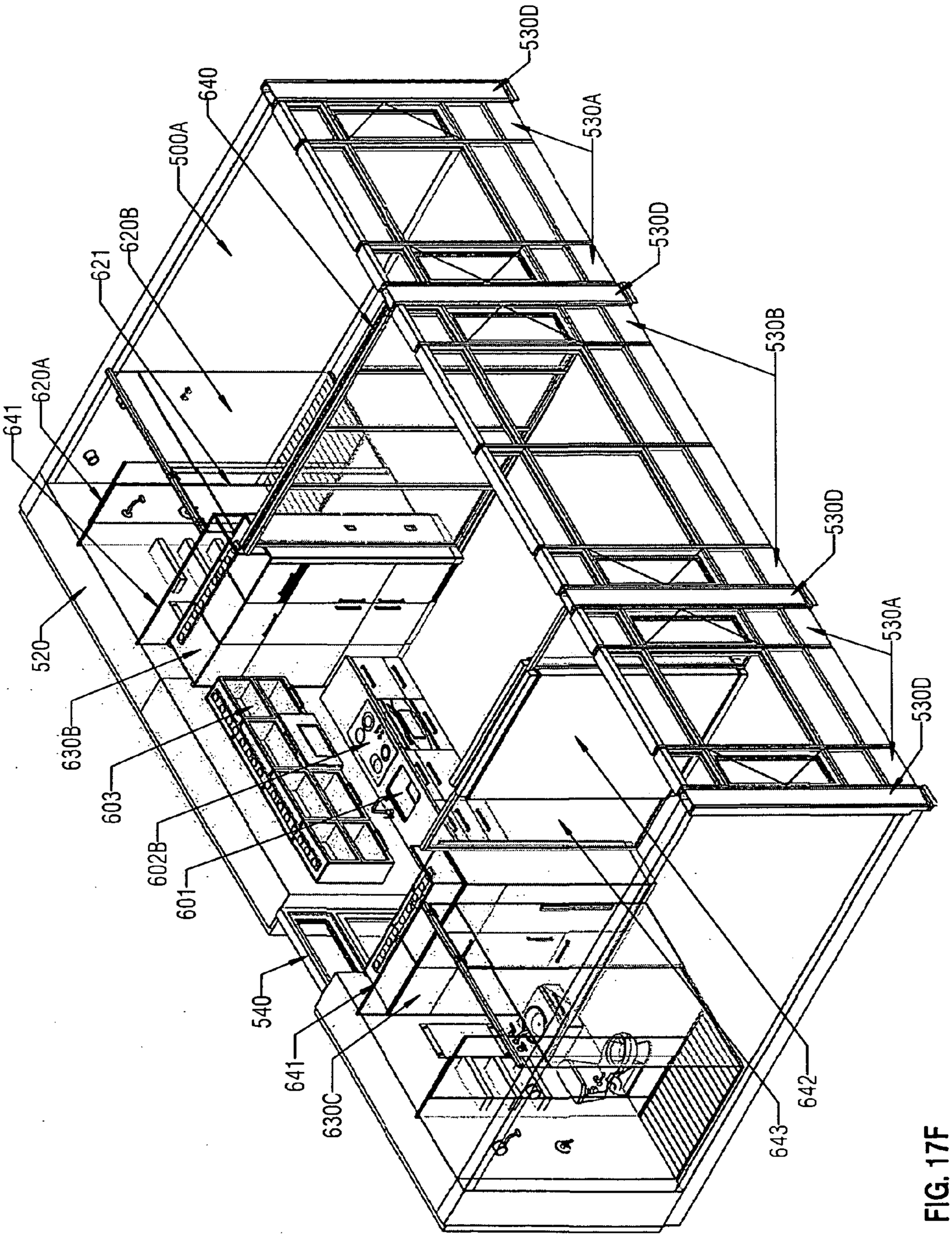
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FIG. 17F

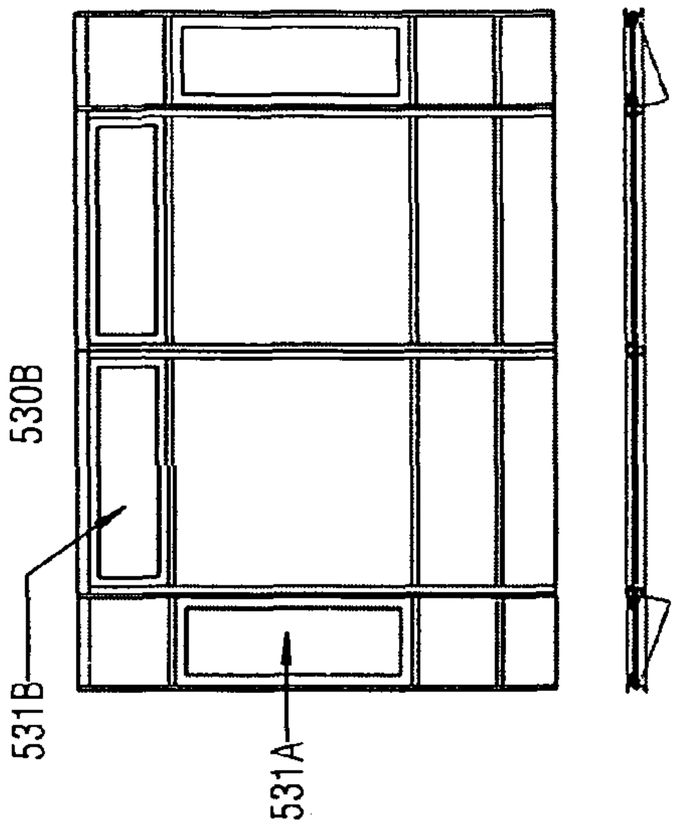

FIG. 18B

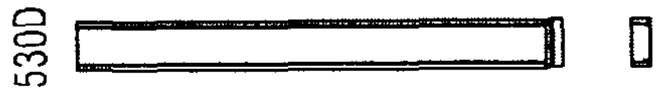

FIG. 18D

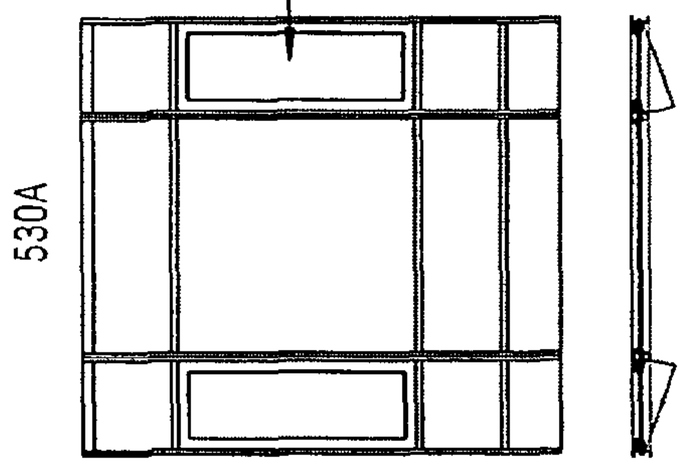

FIG. 18A

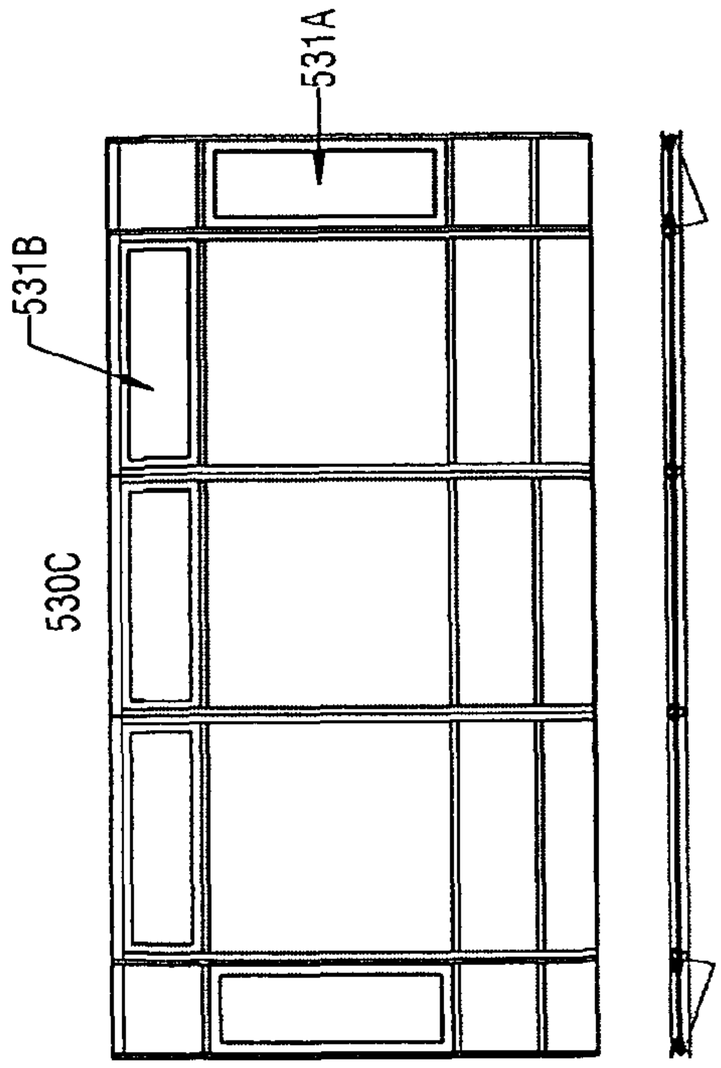

FIG. 18C

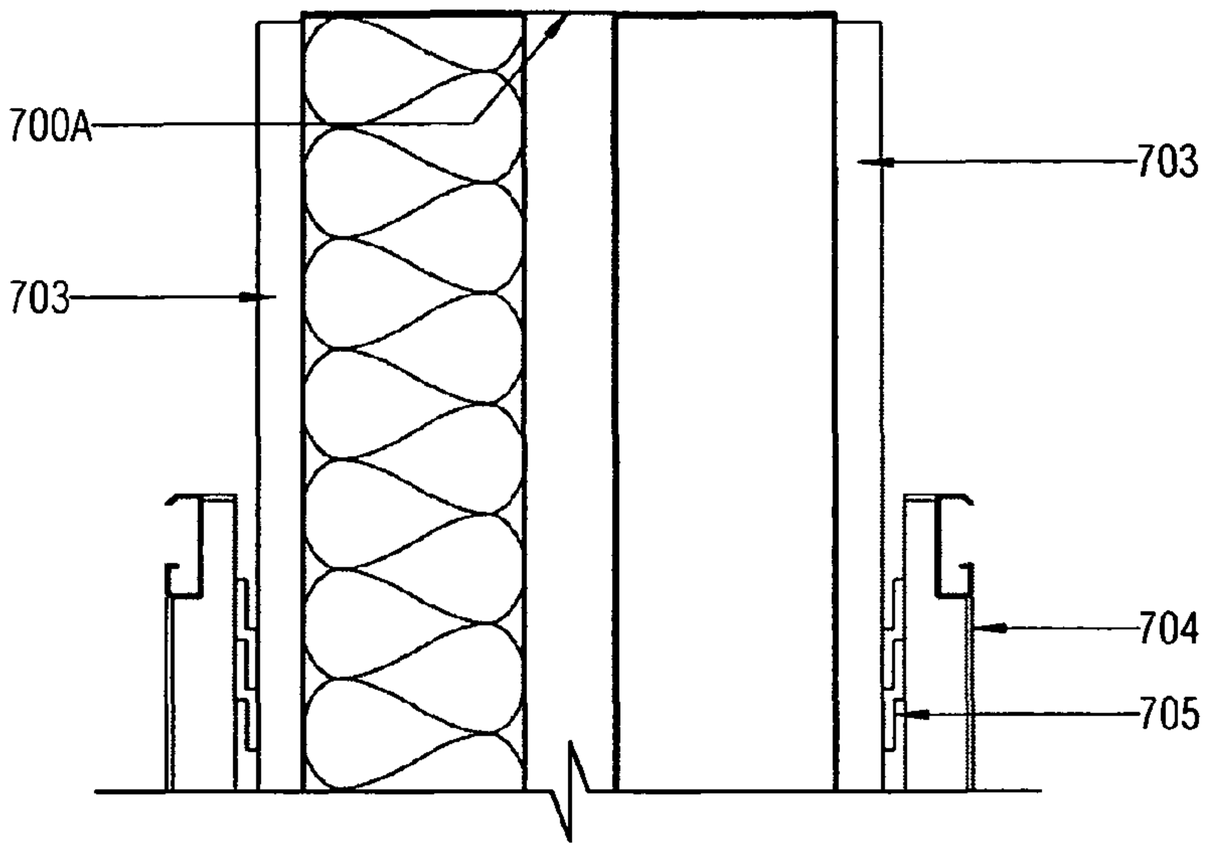

FIG. 19A

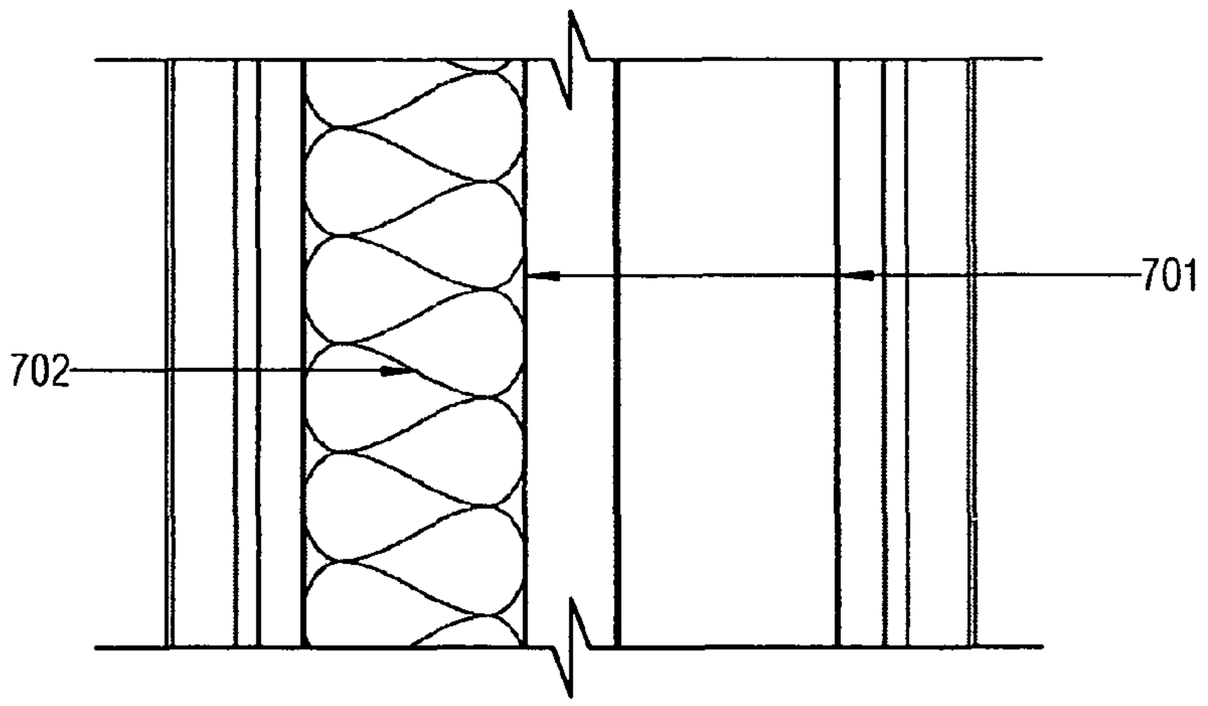

FIG. 19B

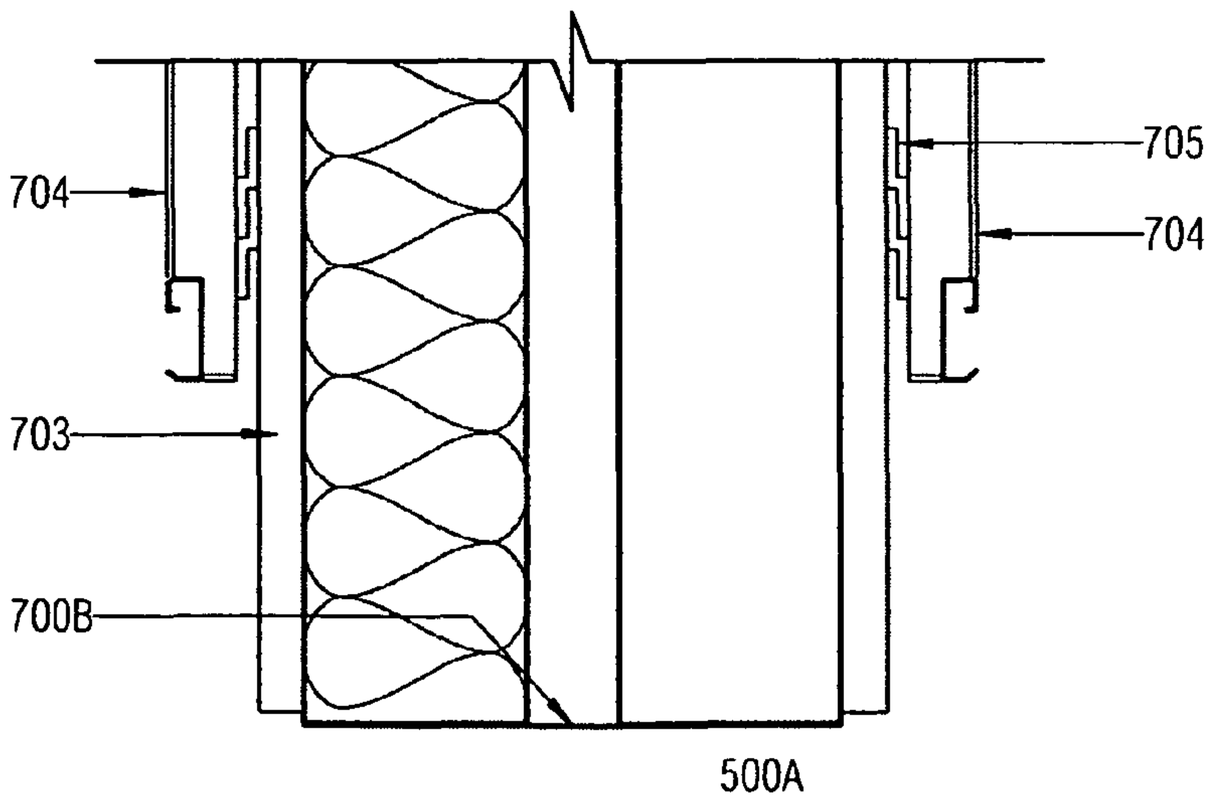

FIG. 19C

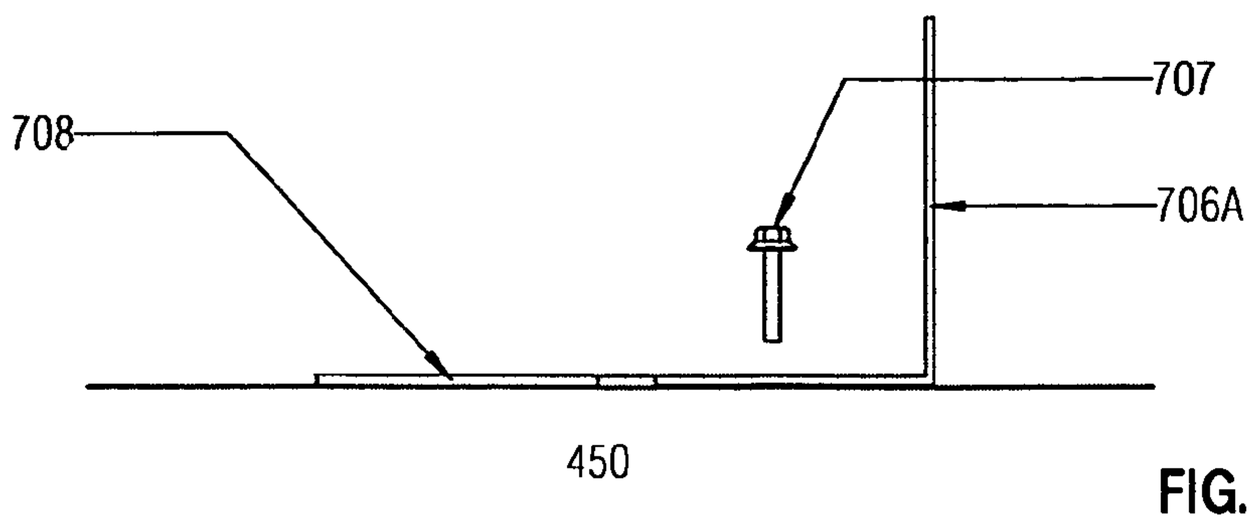

FIG. 20A

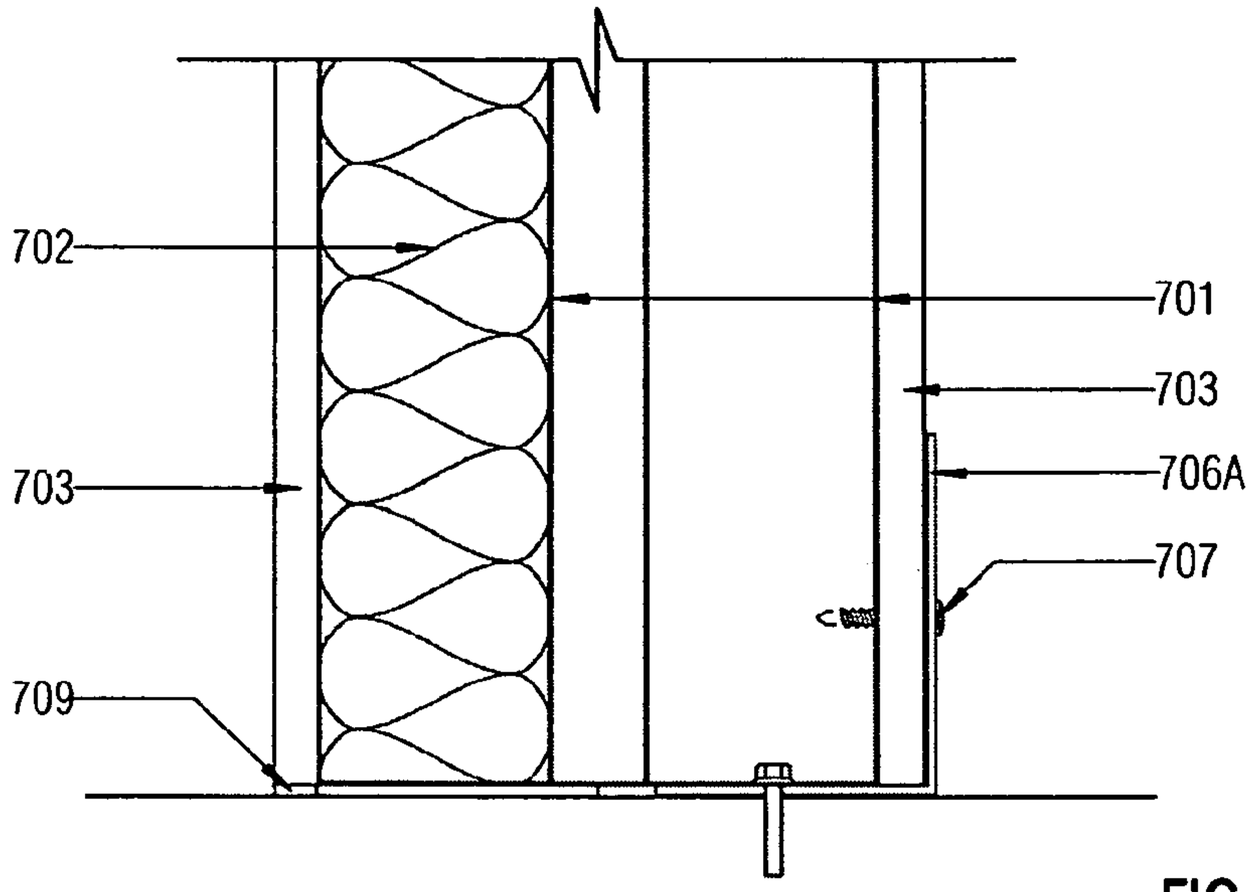

FIG. 20B

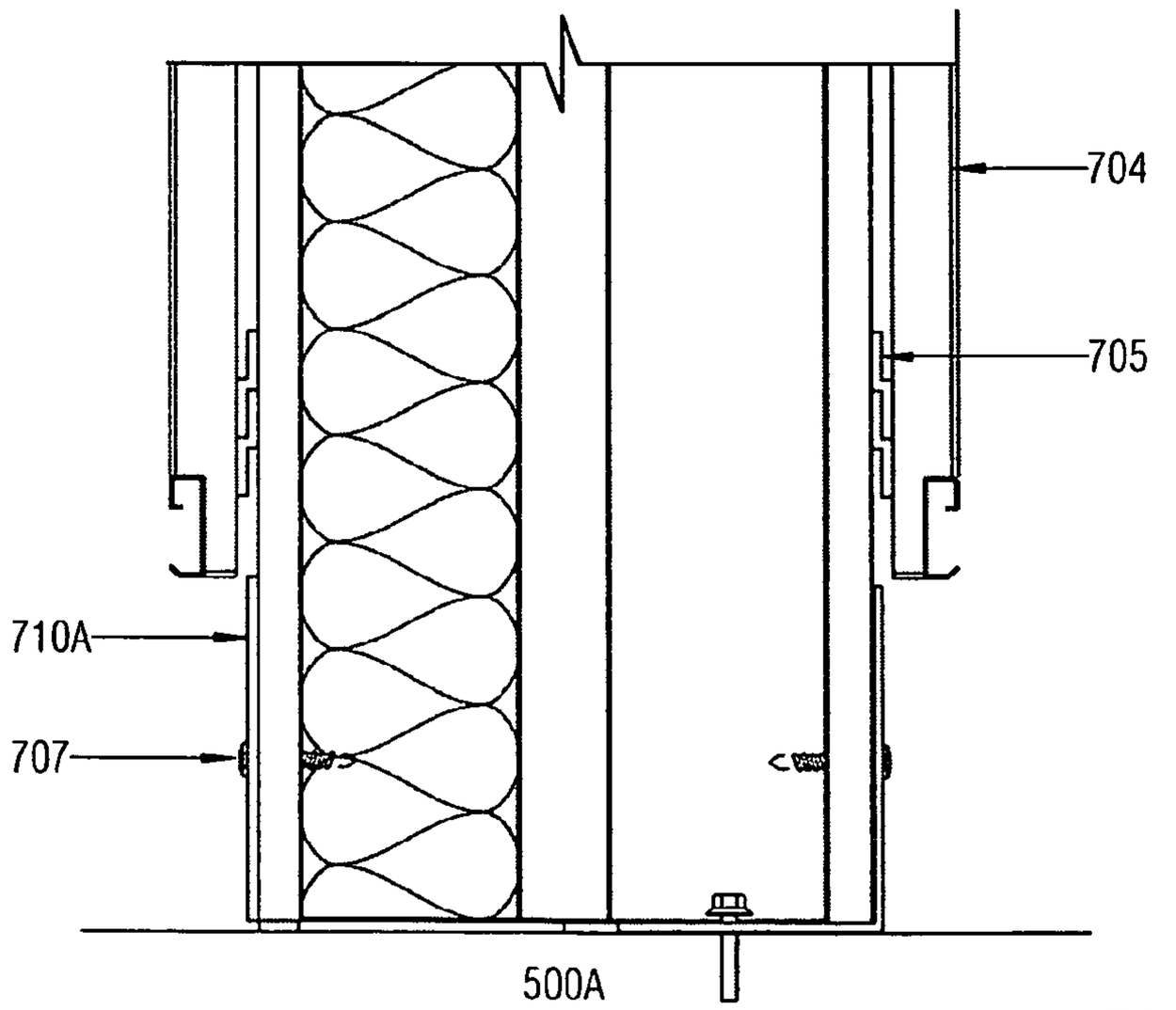

FIG. 20C

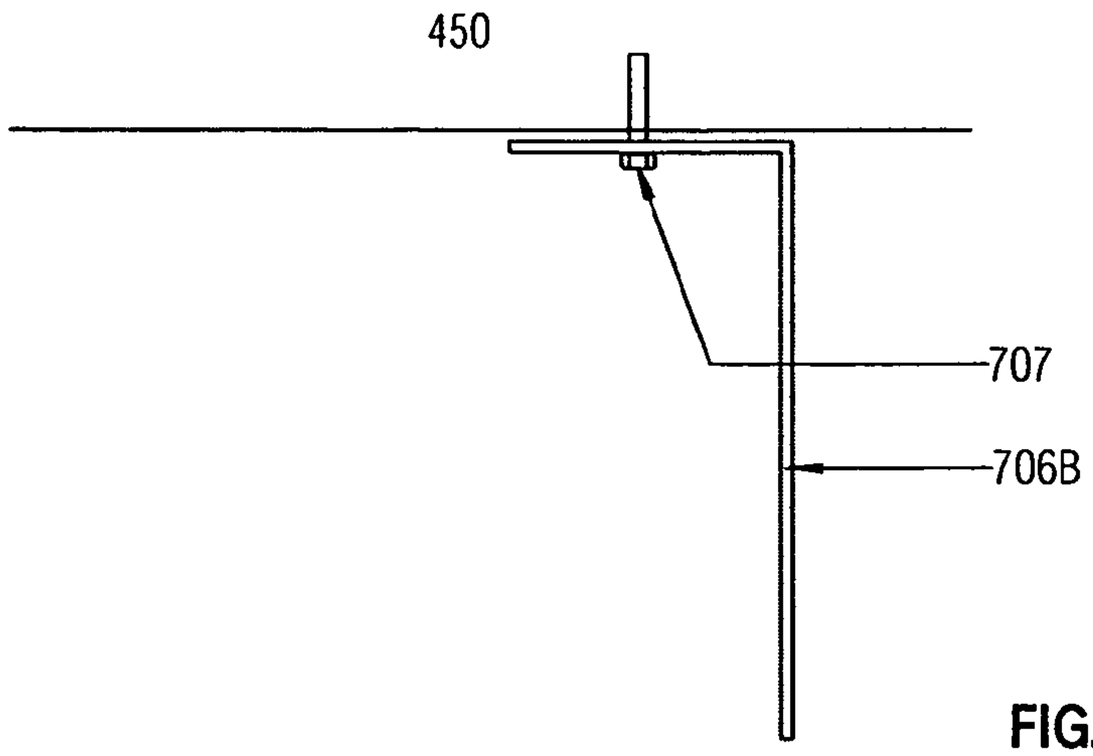

FIG. 21A

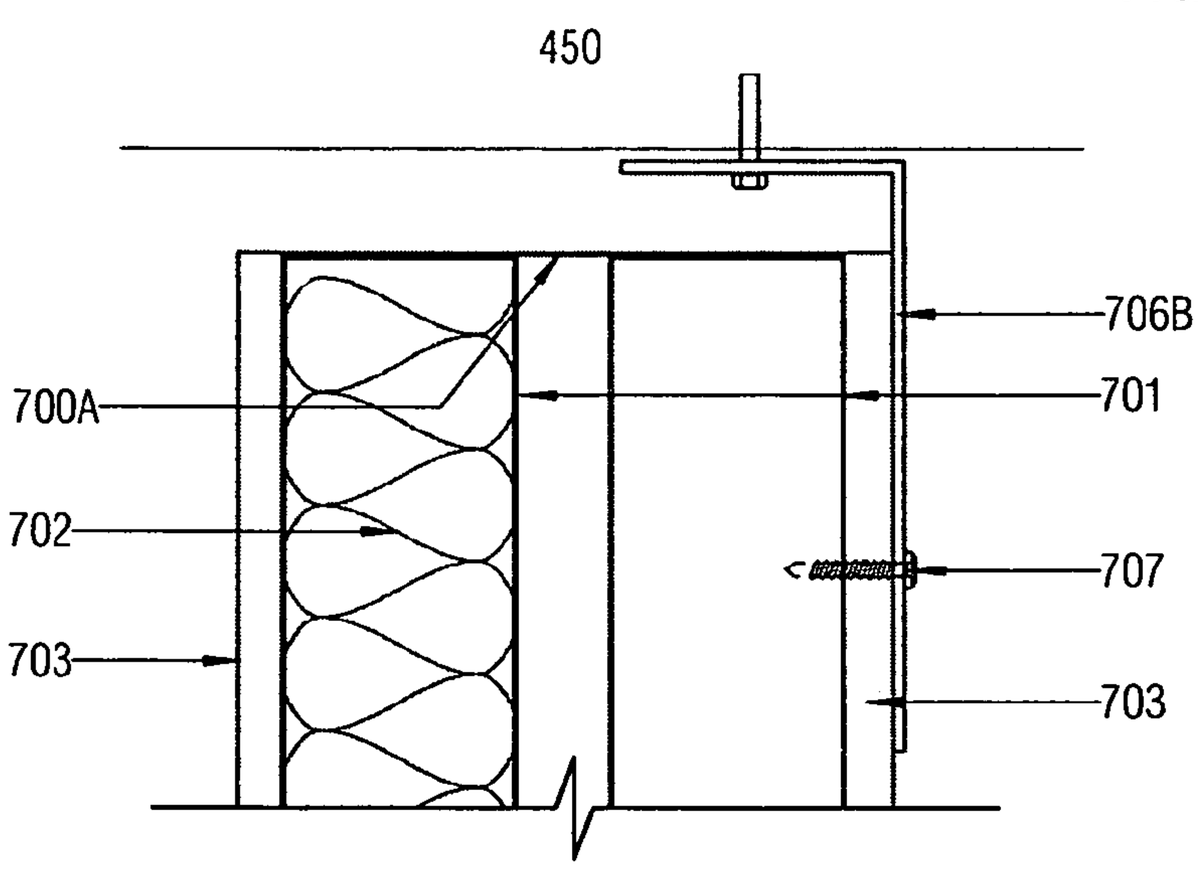

FIG. 21B

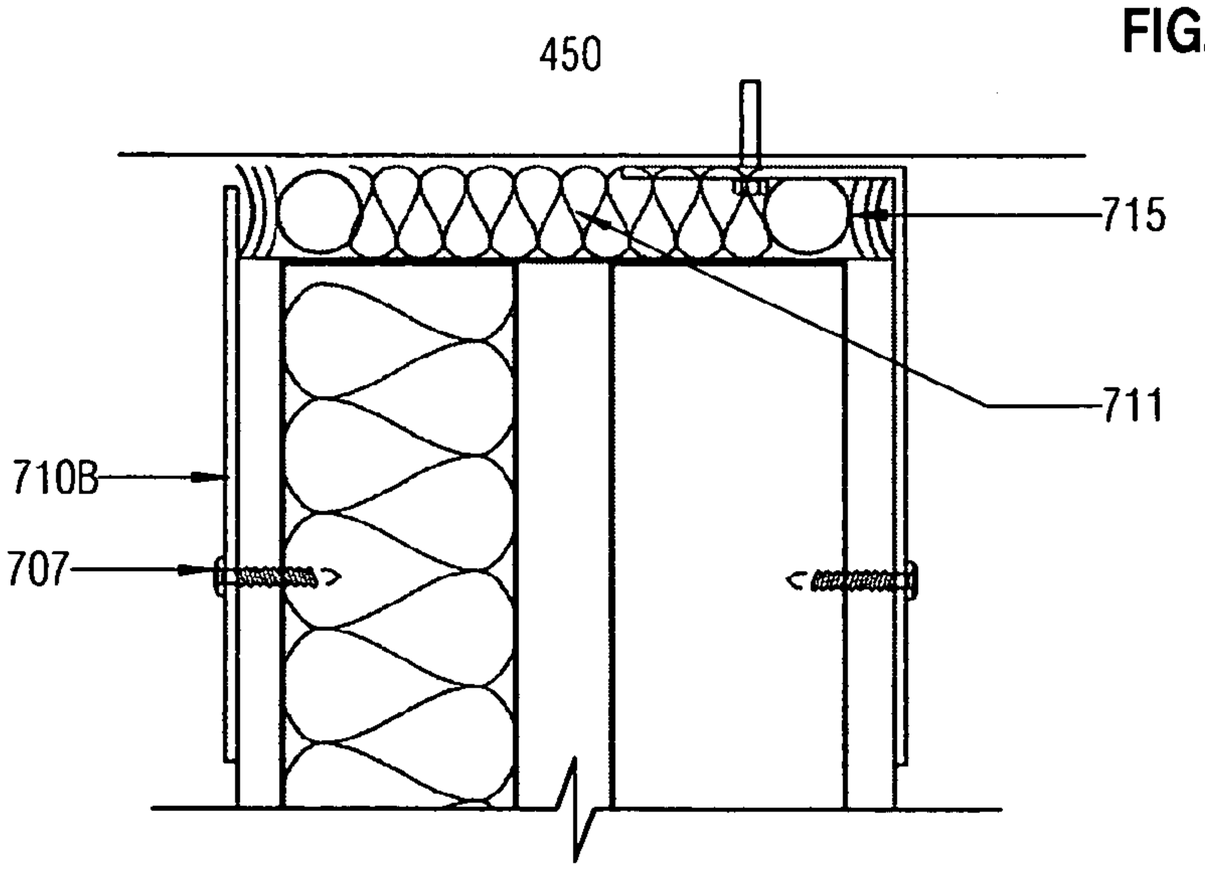

FIG. 21C

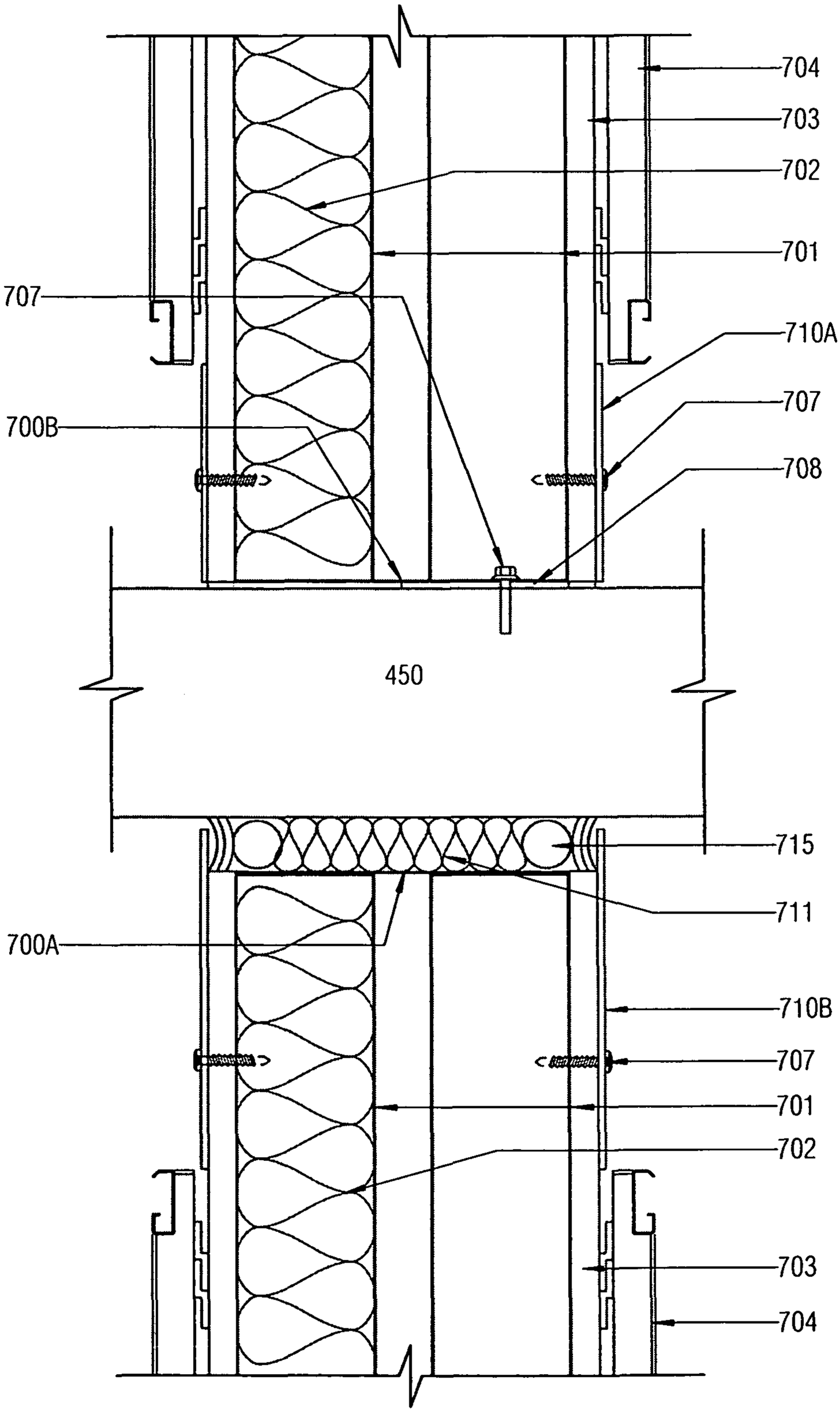
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FIG. 22

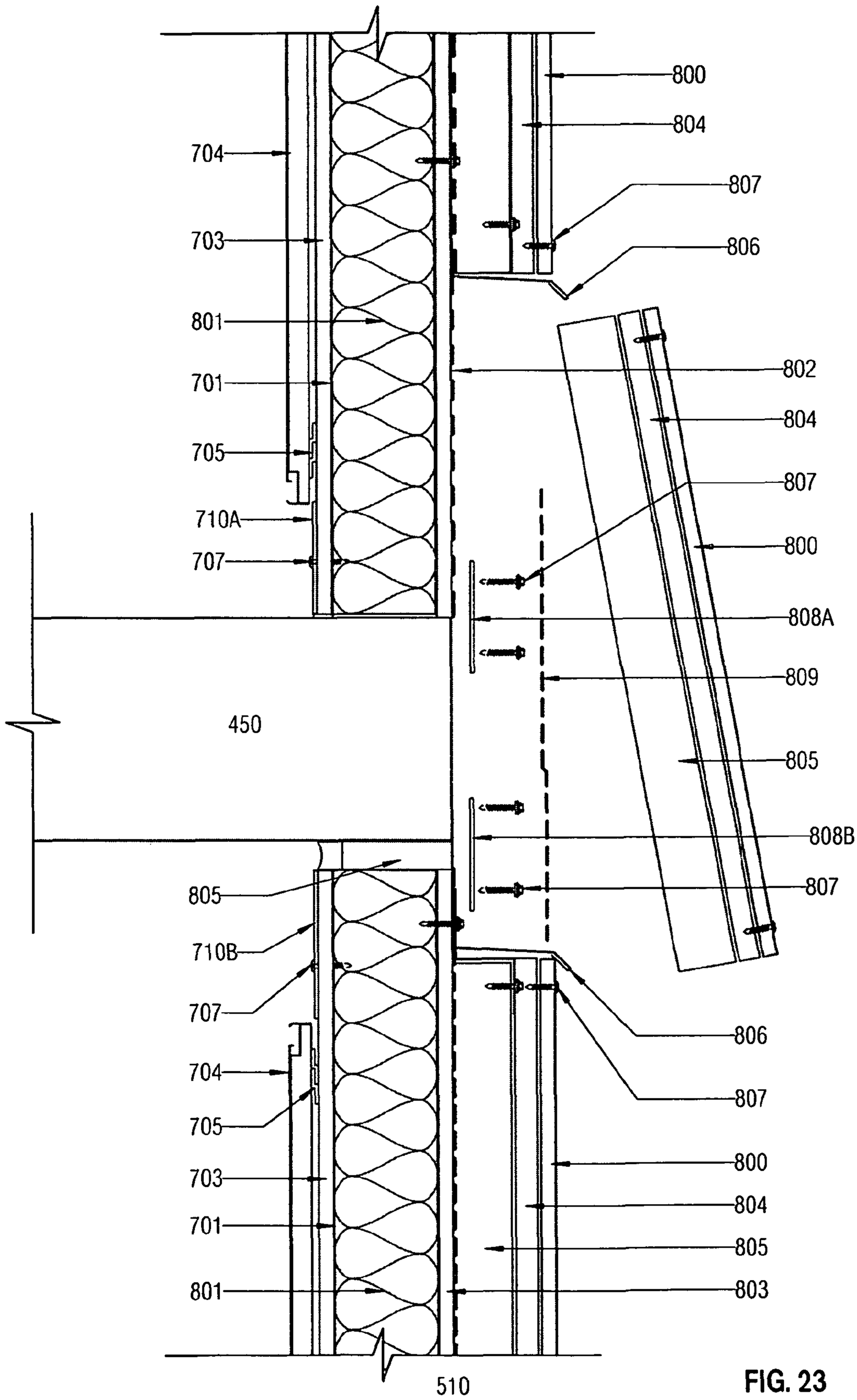
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FIG. 23

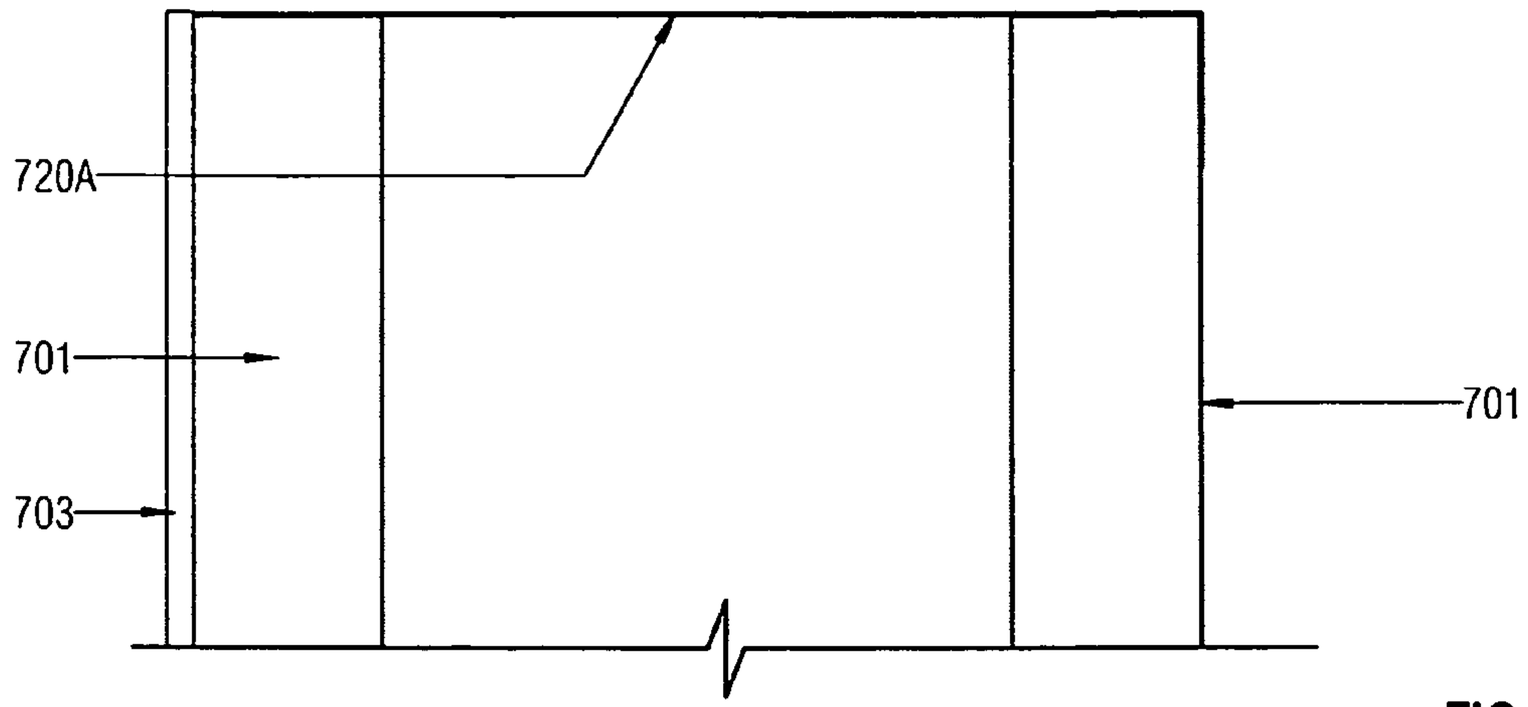

FIG. 24A

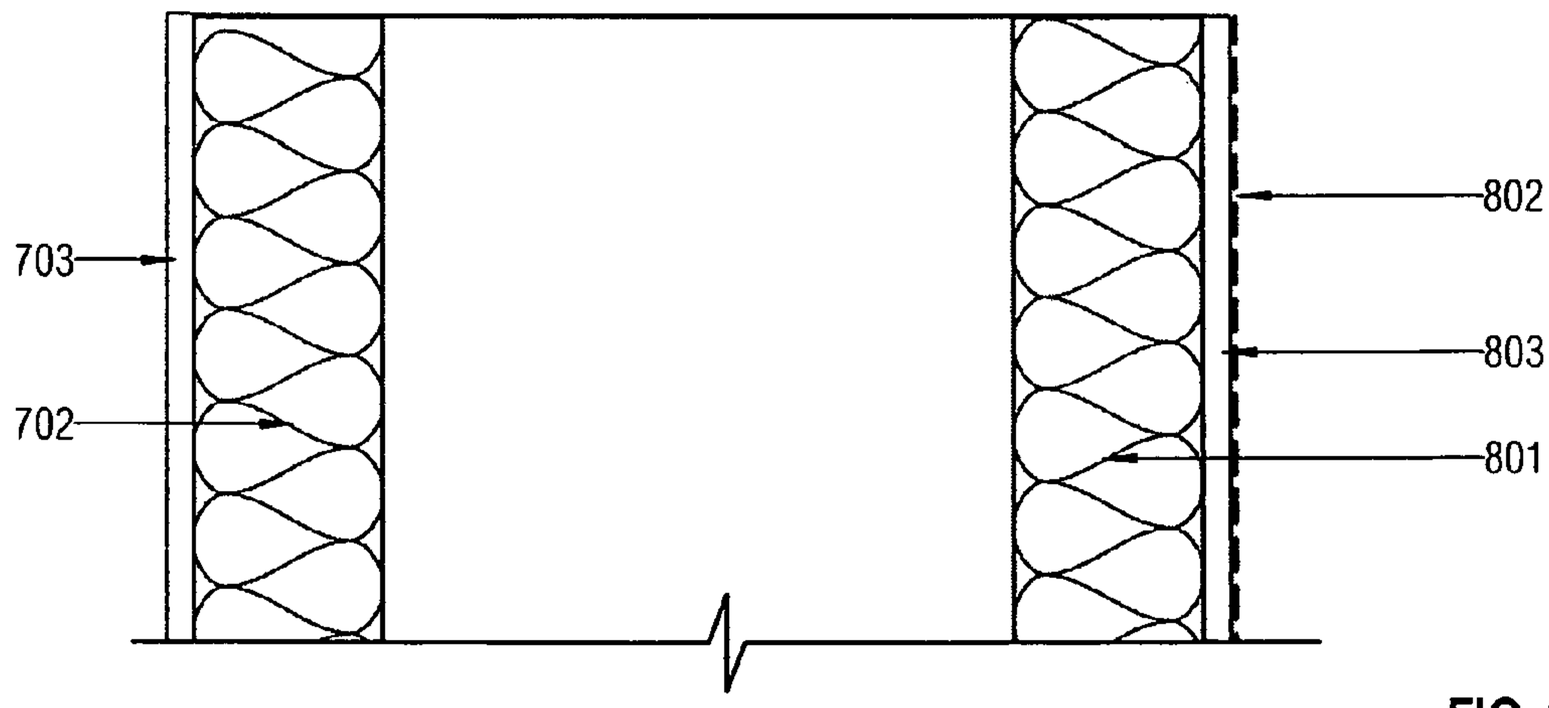

FIG. 24B

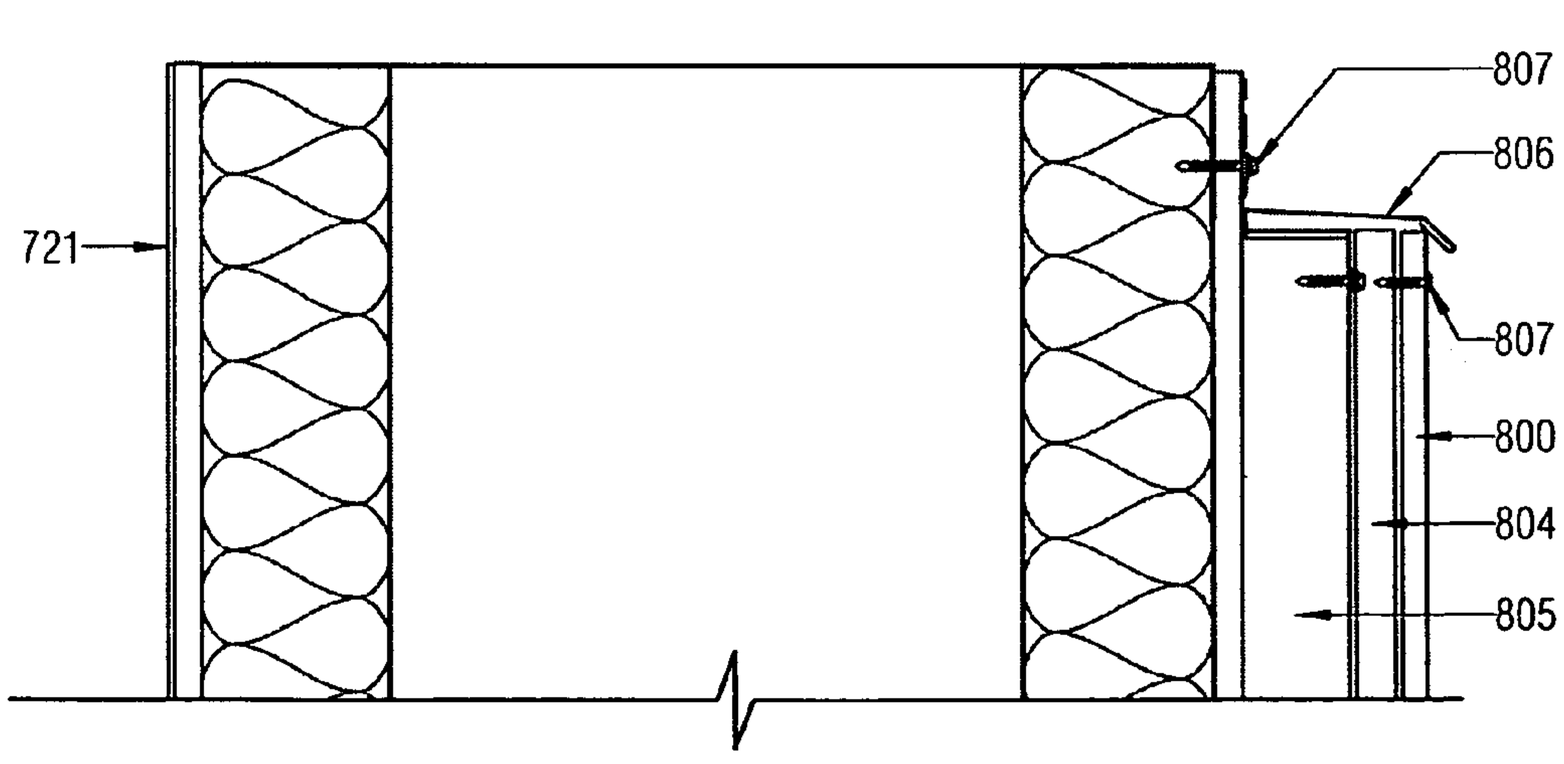

FIG. 24C

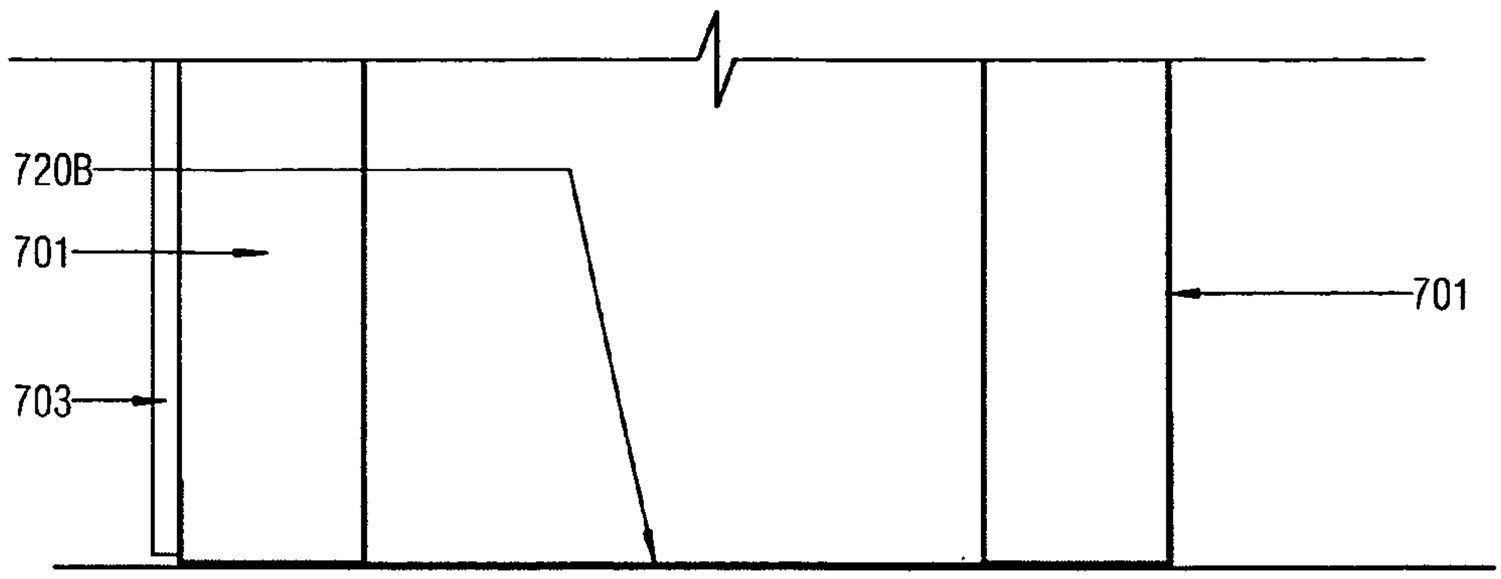

FIG. 25A

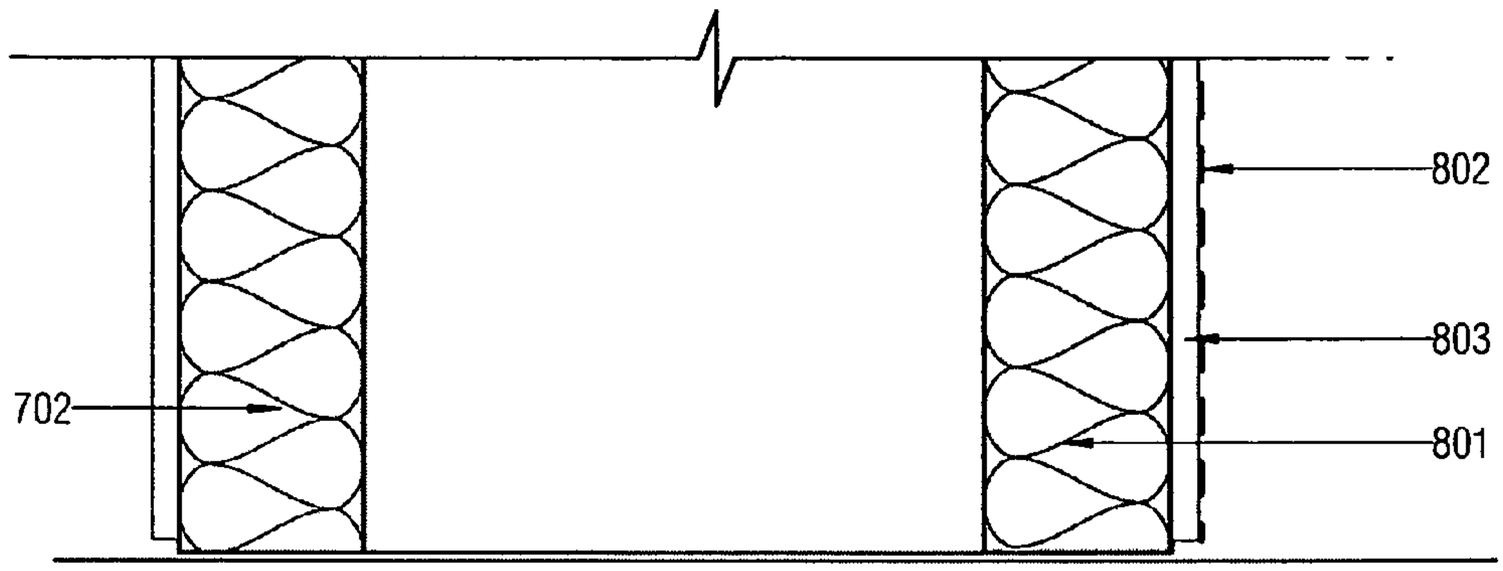

FIG. 25B

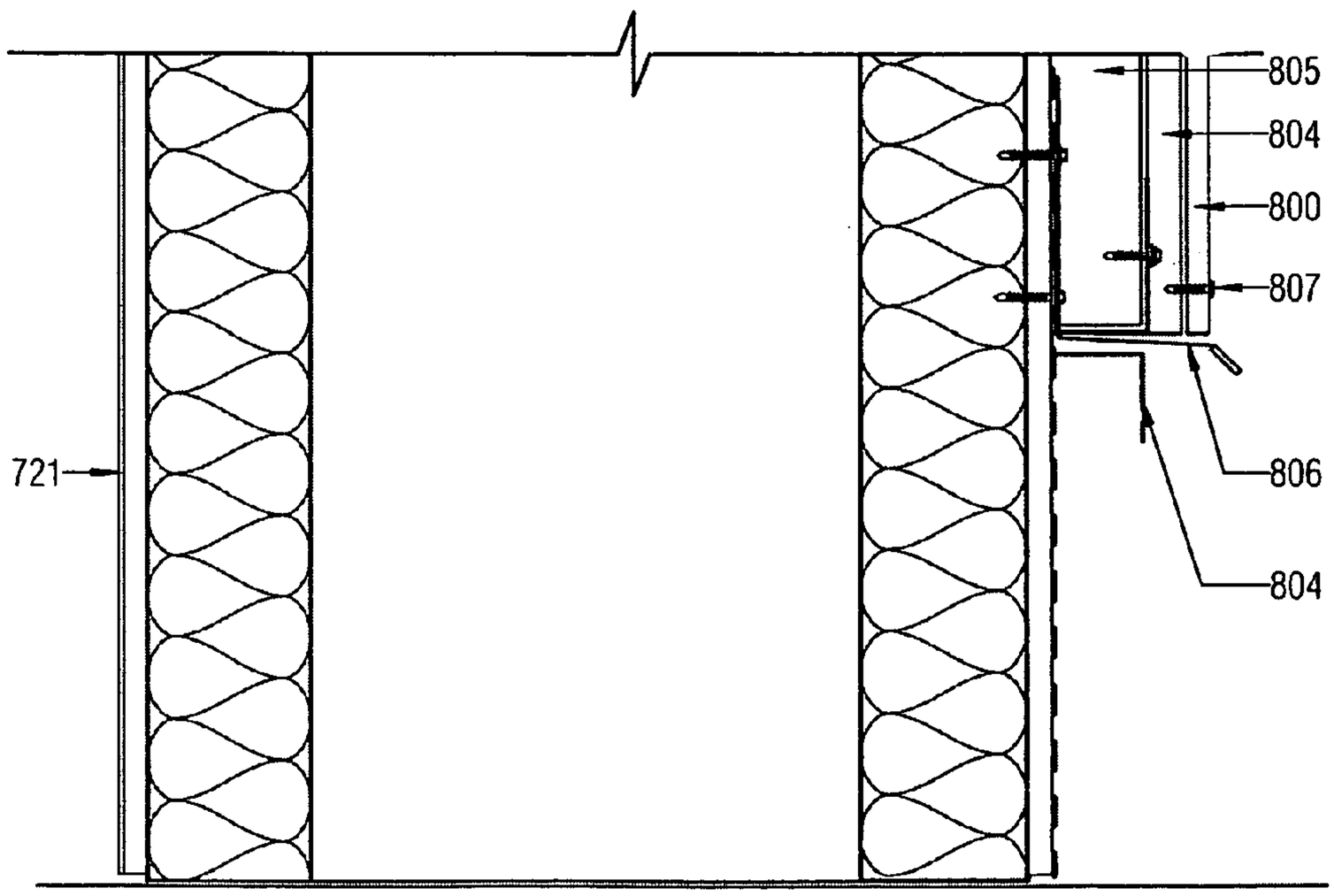

FIG. 25C

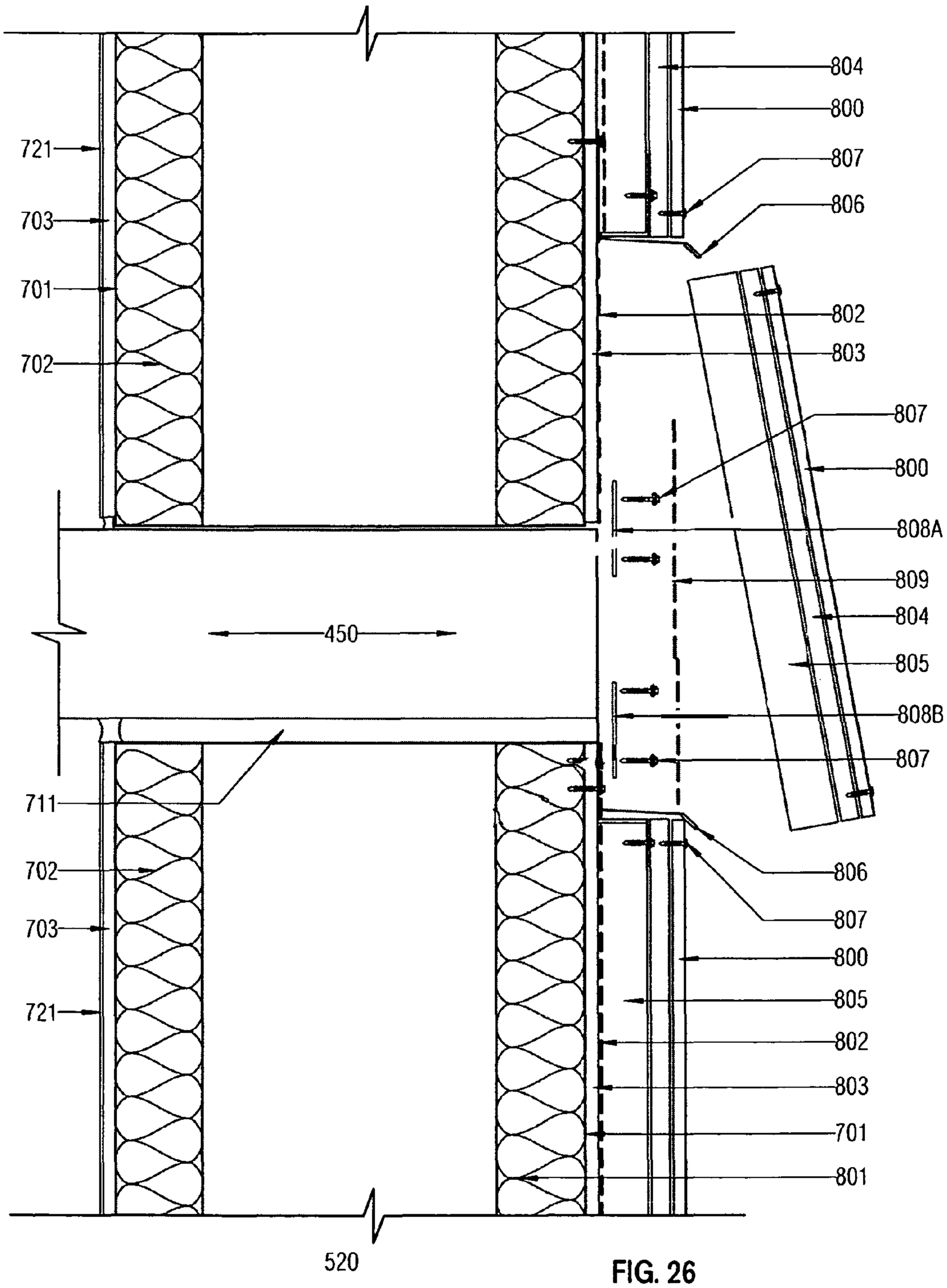
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FIG. 26

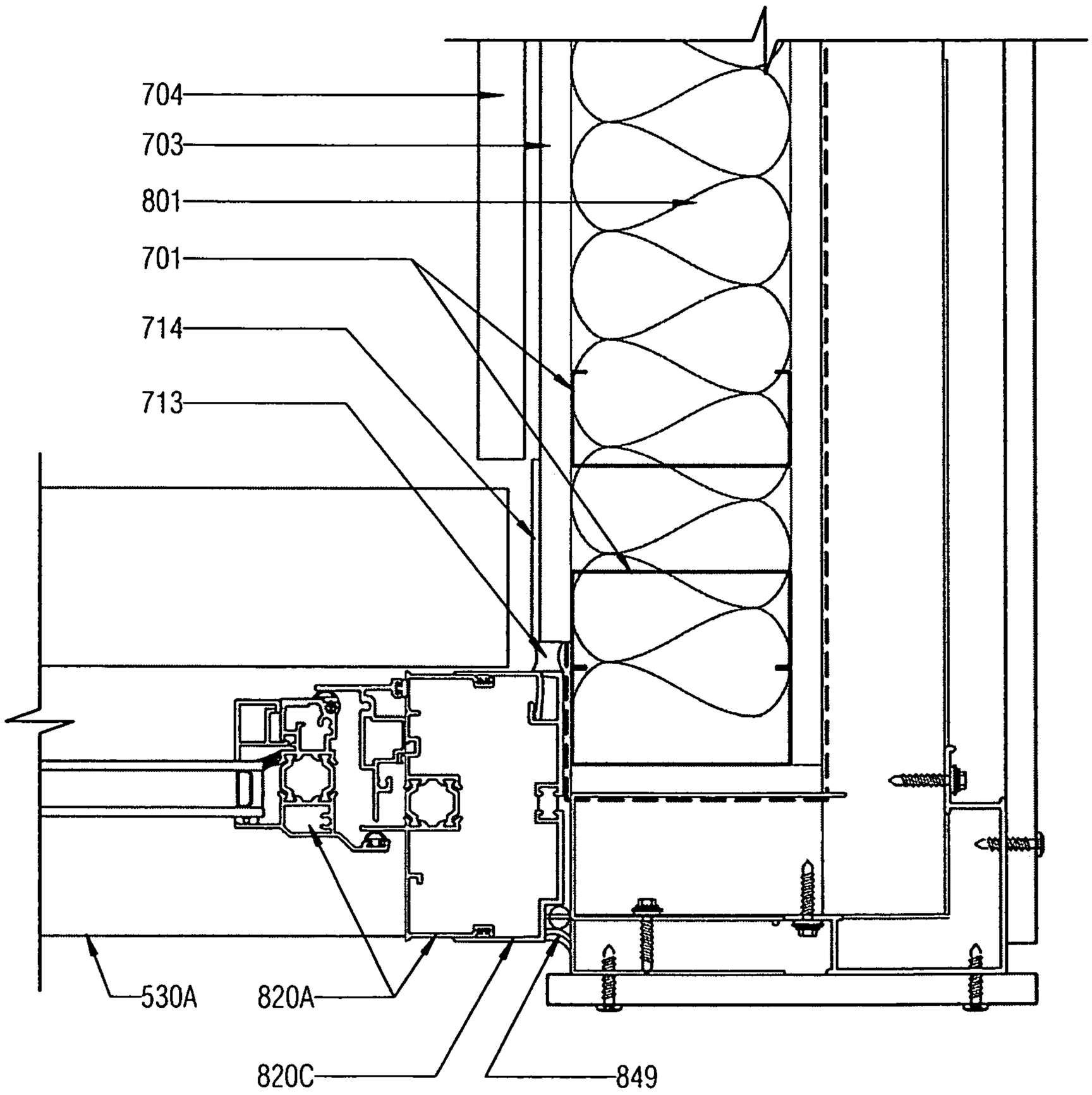


FIG. 27A

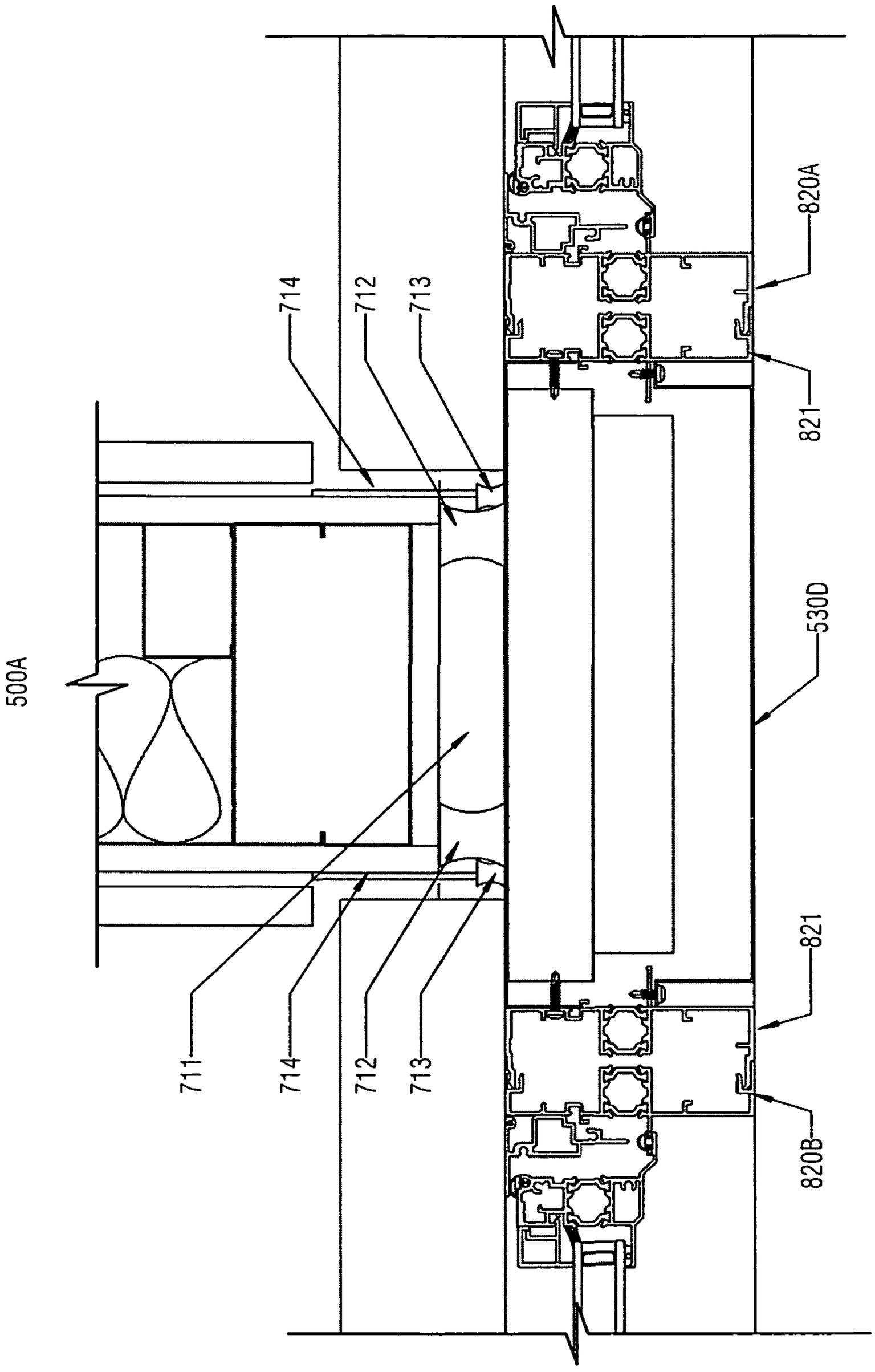


FIG. 27B

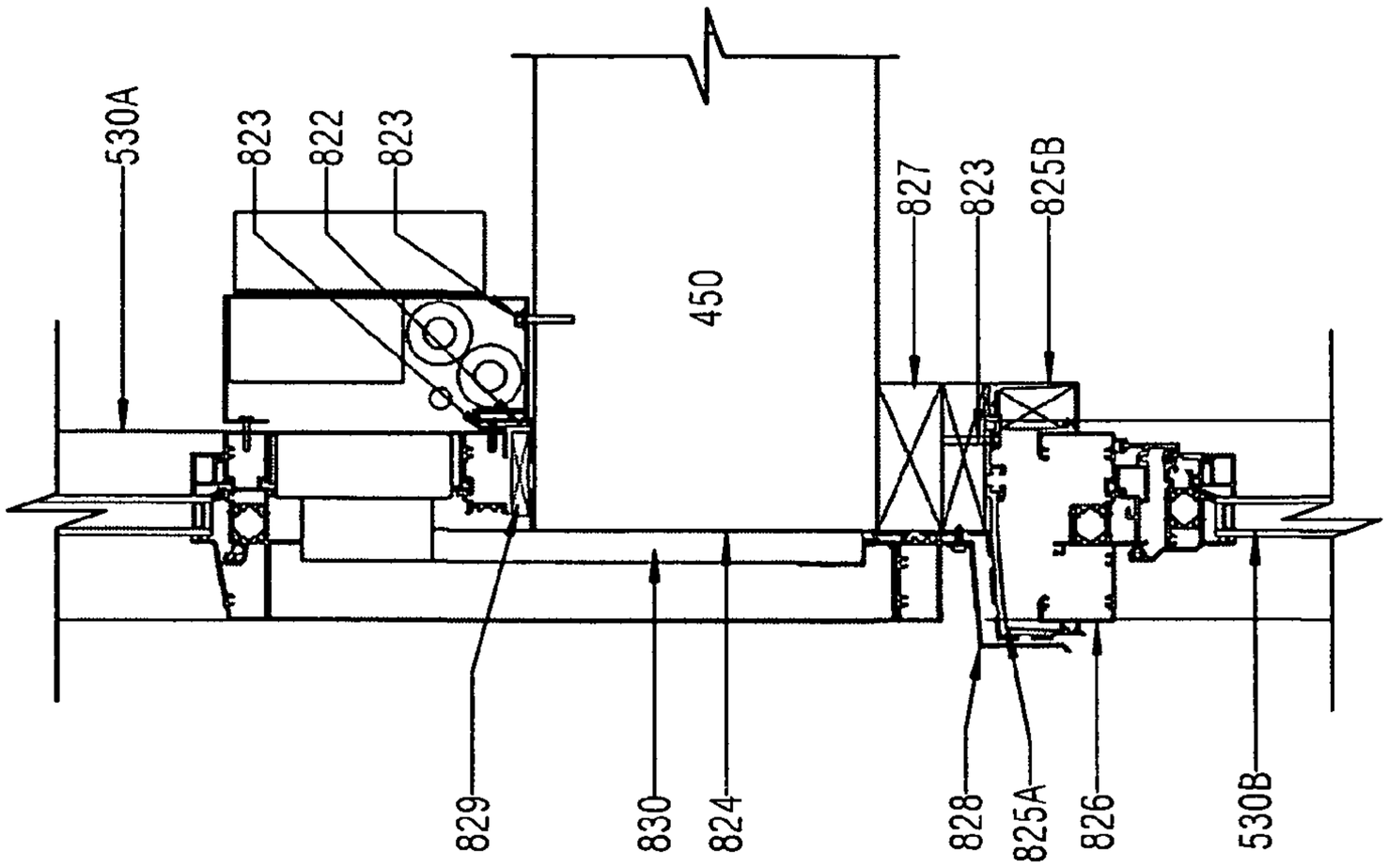


FIG. 28B

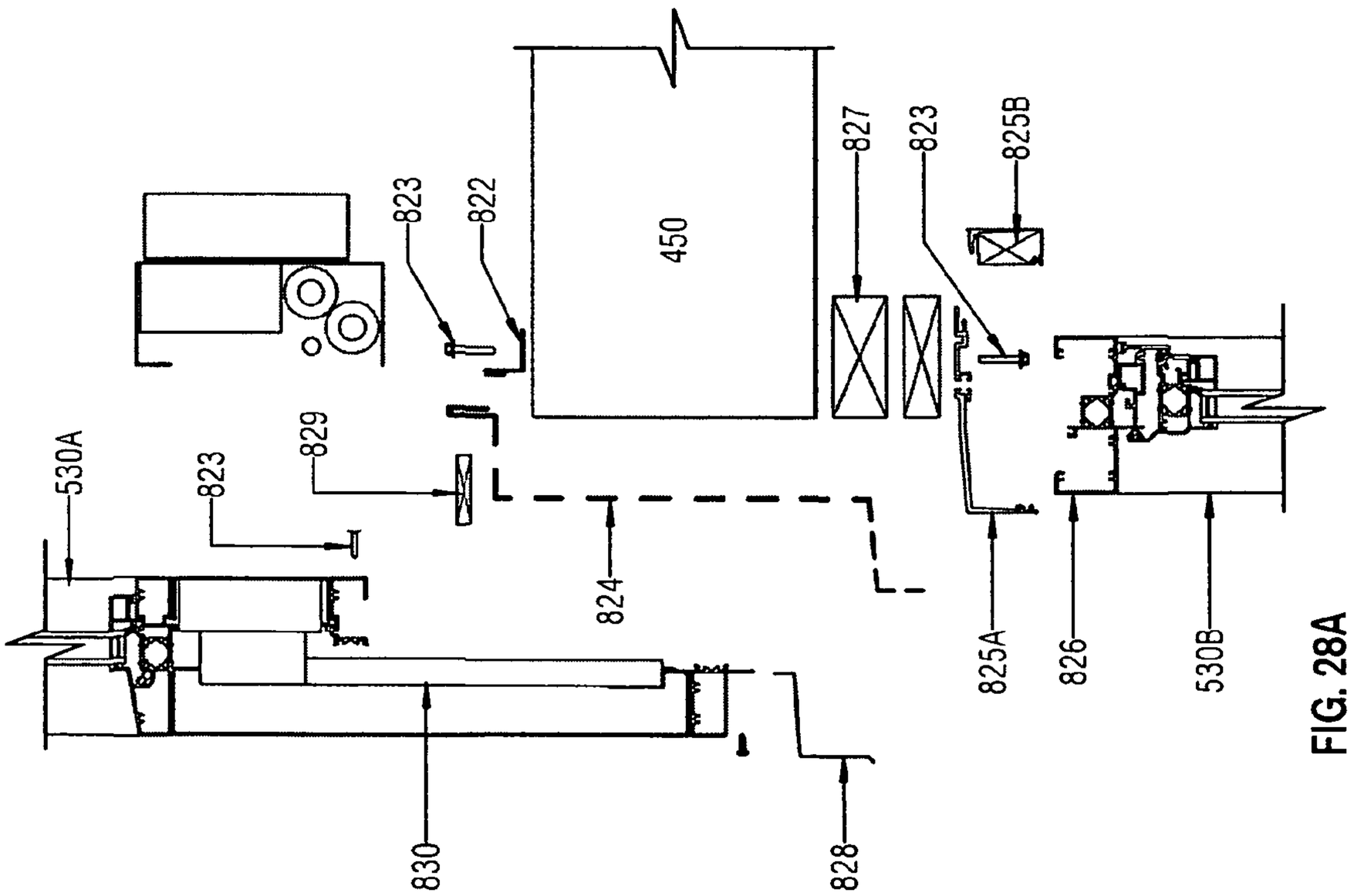


FIG. 28A

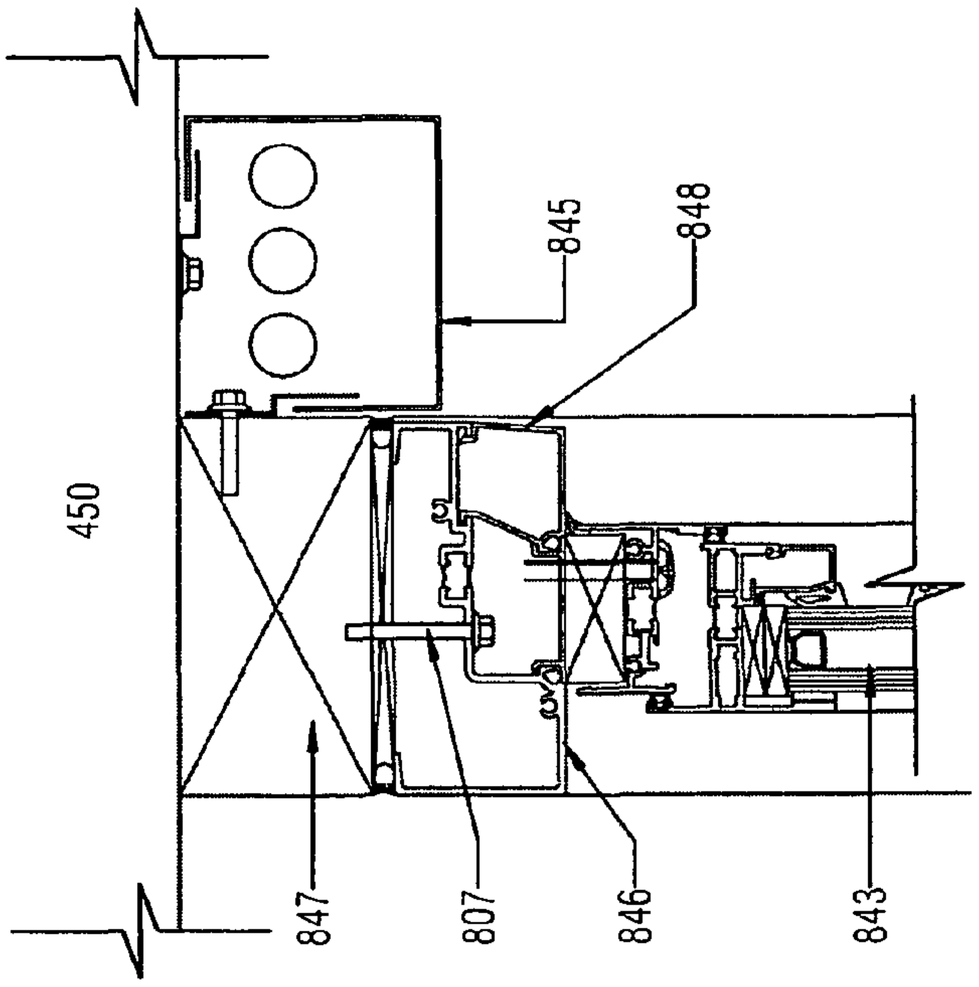


FIG. 29B

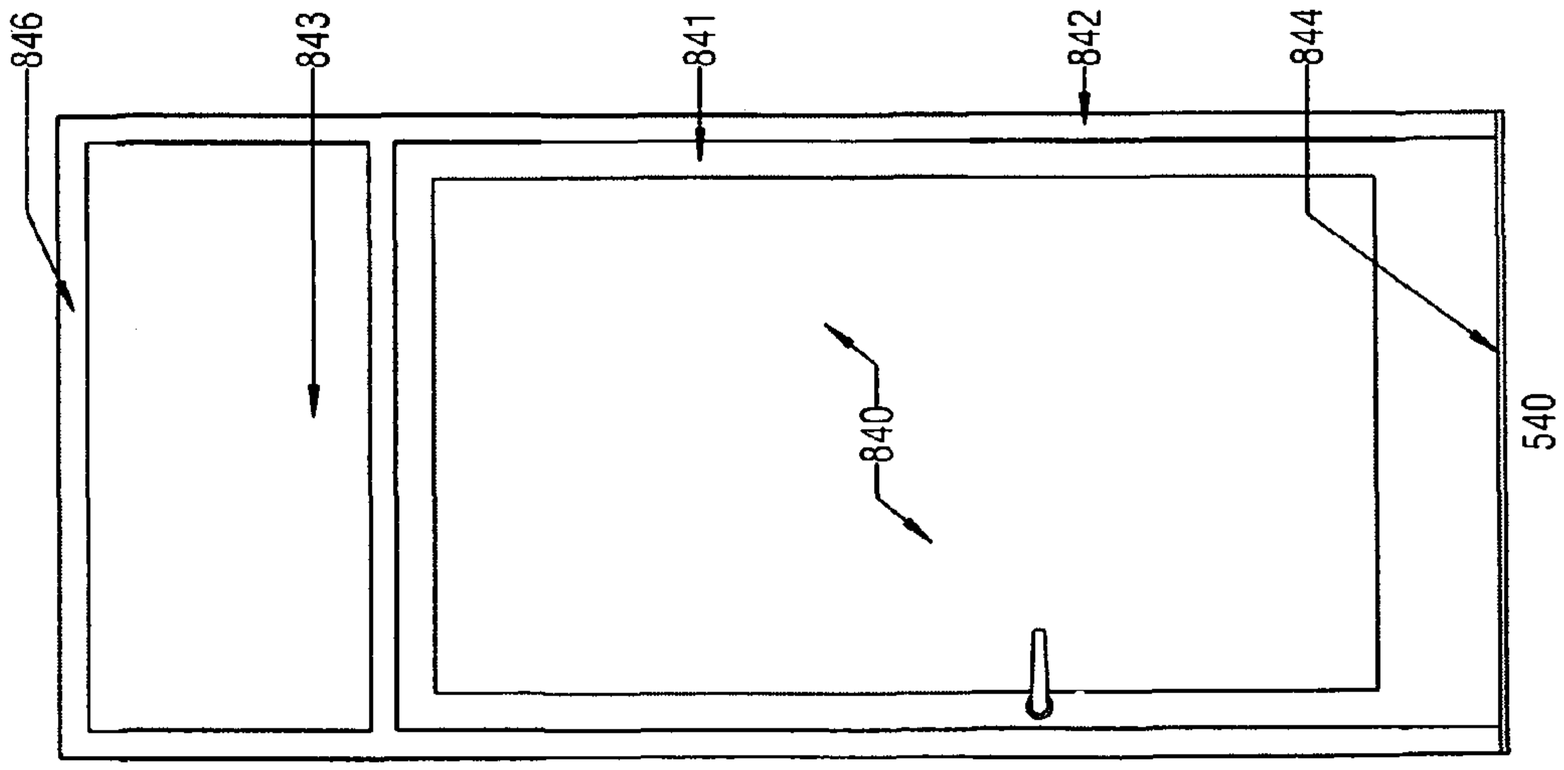


FIG. 29A

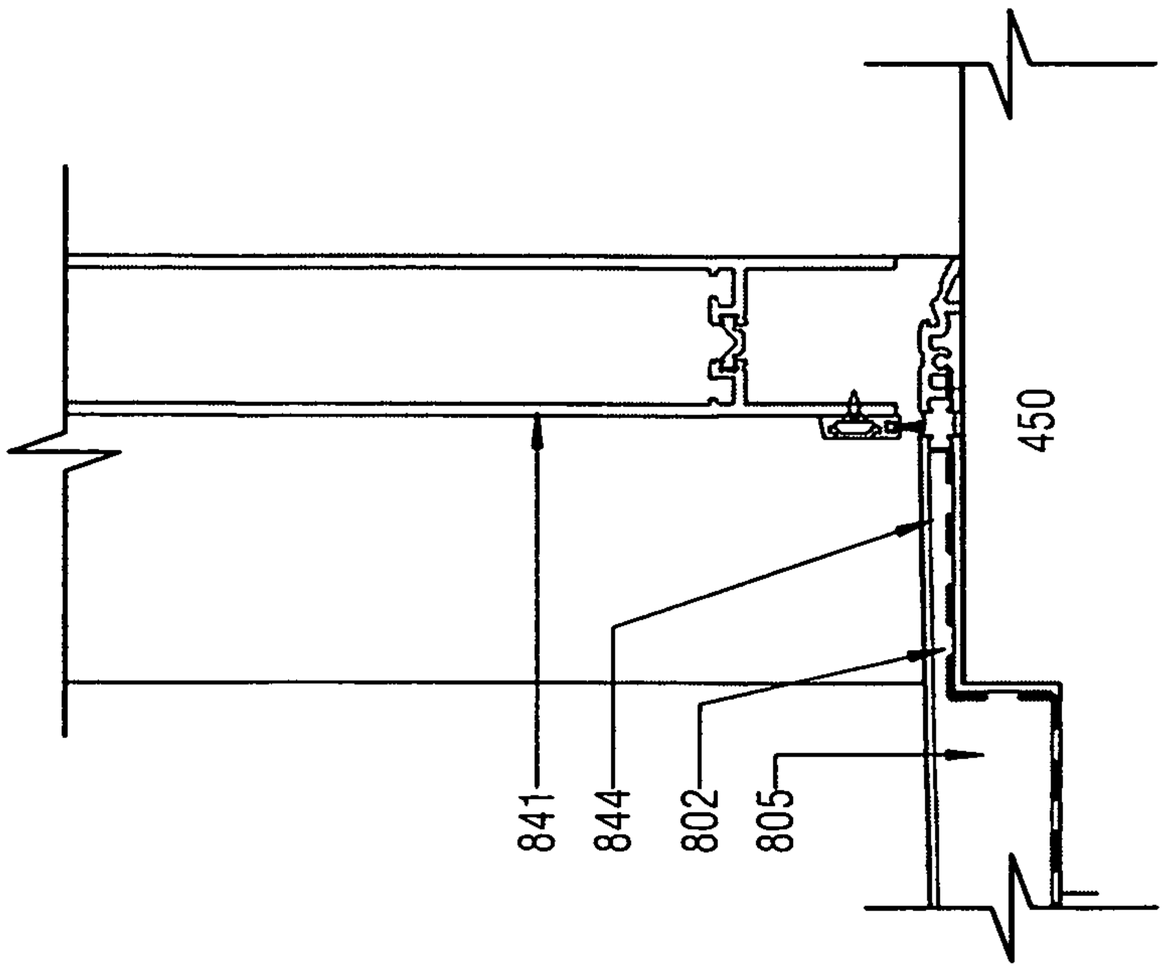


FIG. 29D

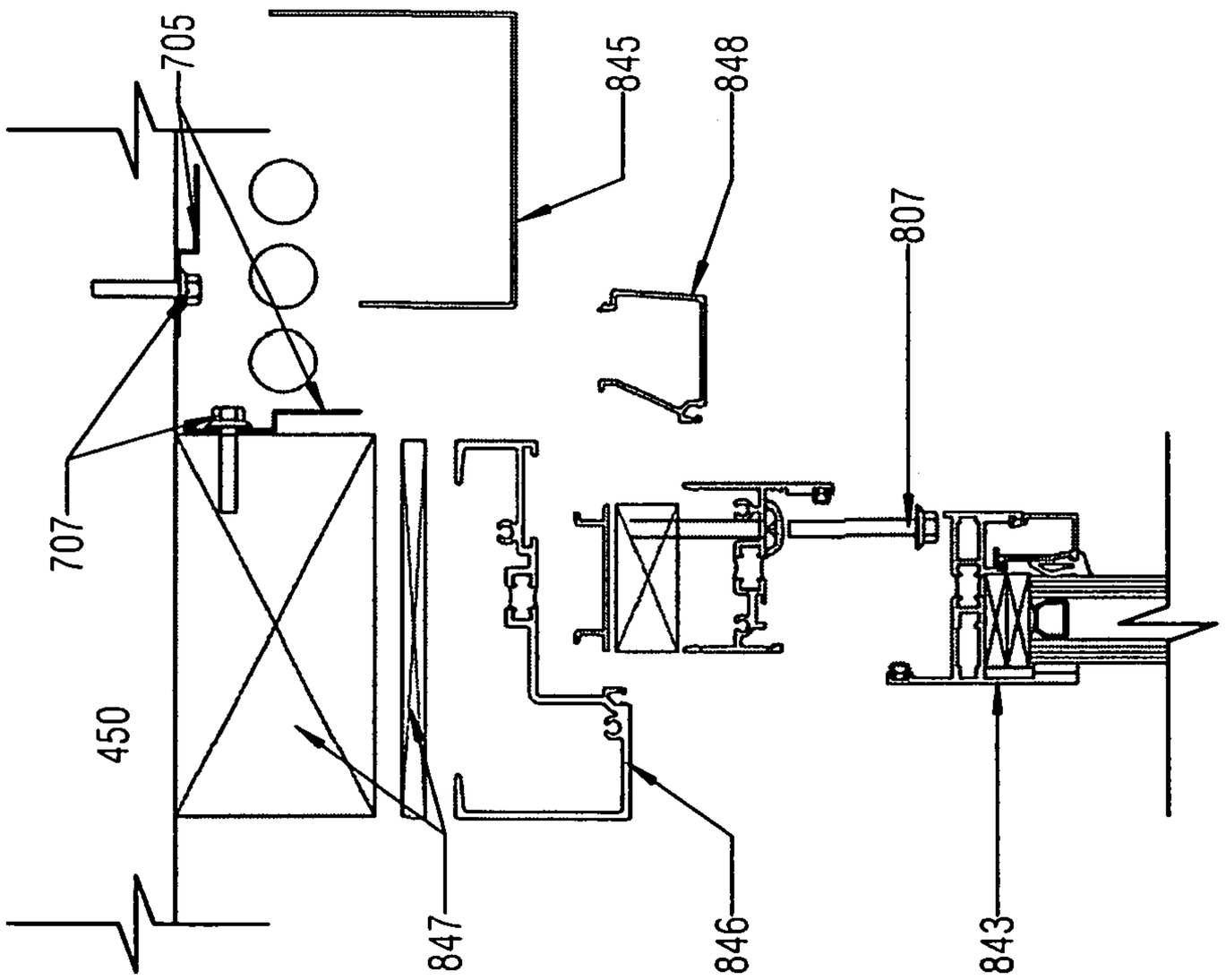


FIG. 29C

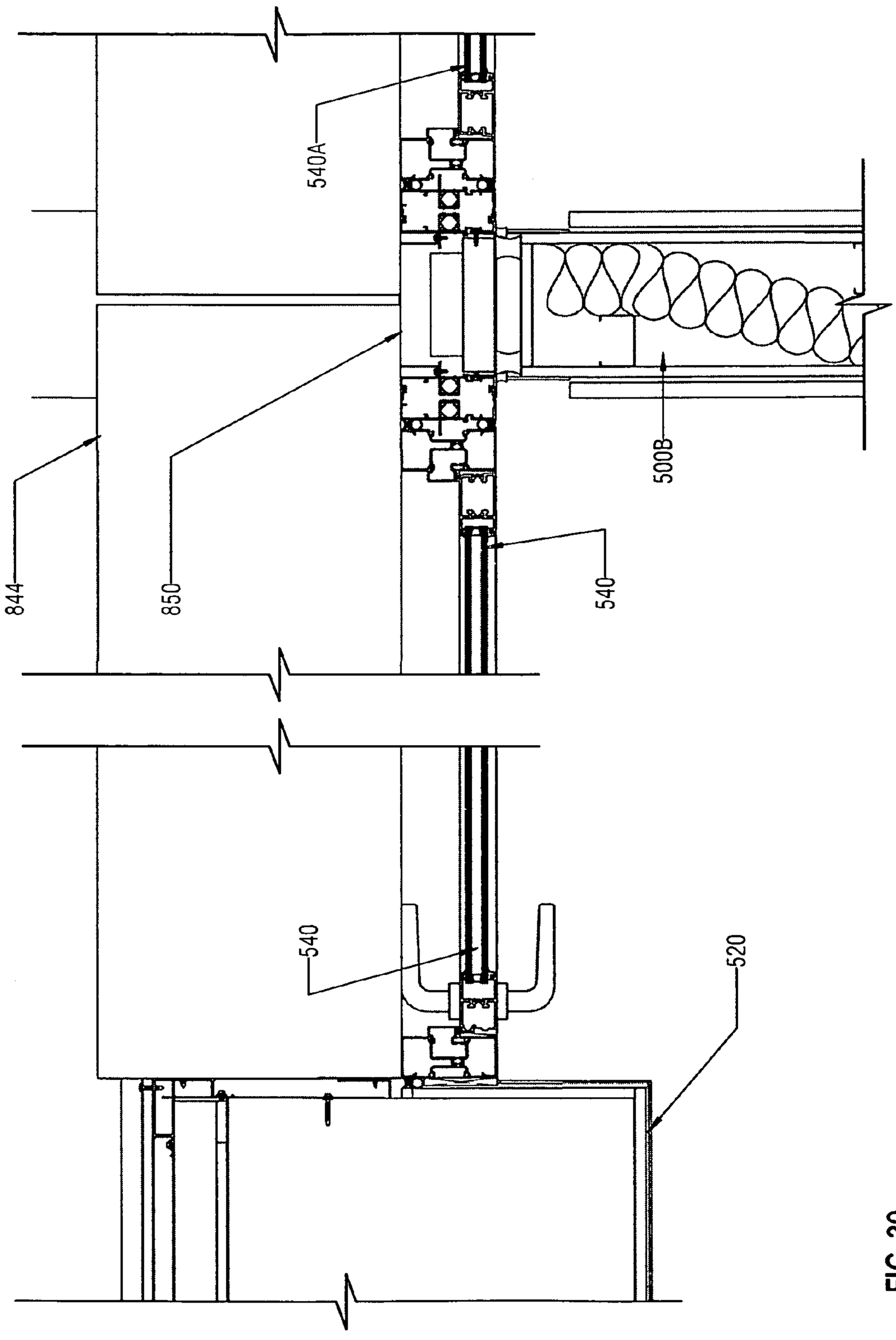


FIG. 30

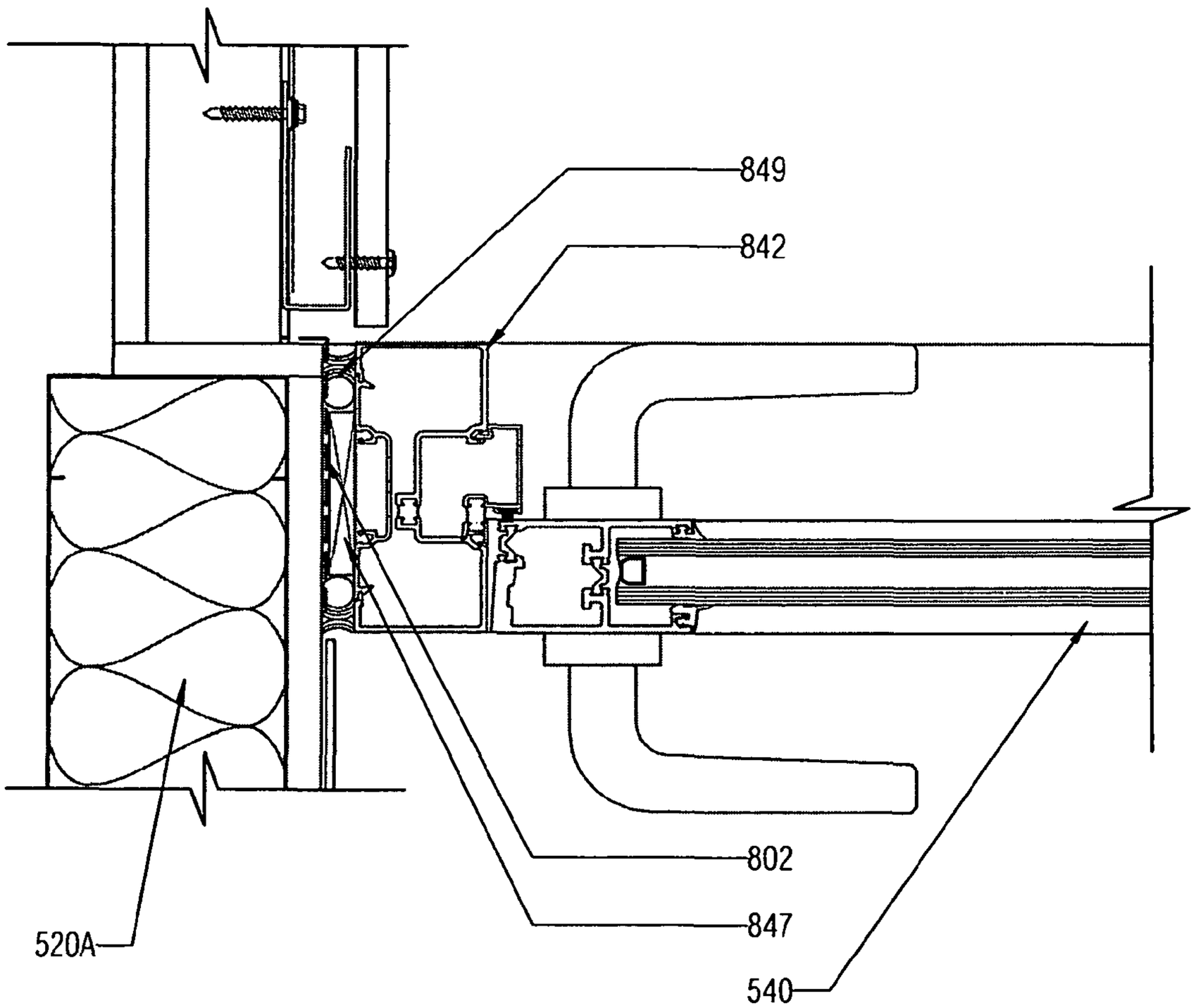


FIG. 31A

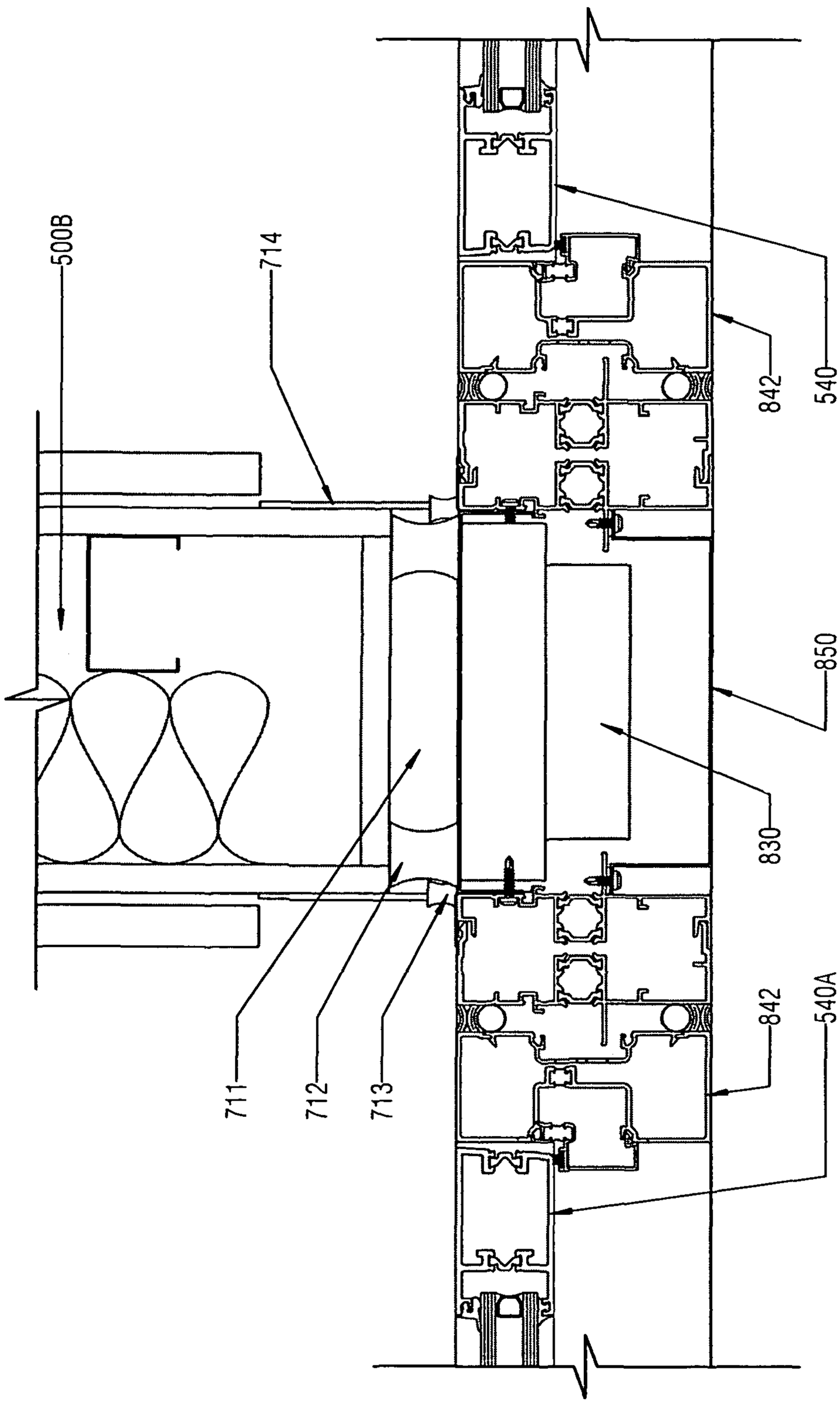


FIG. 31B

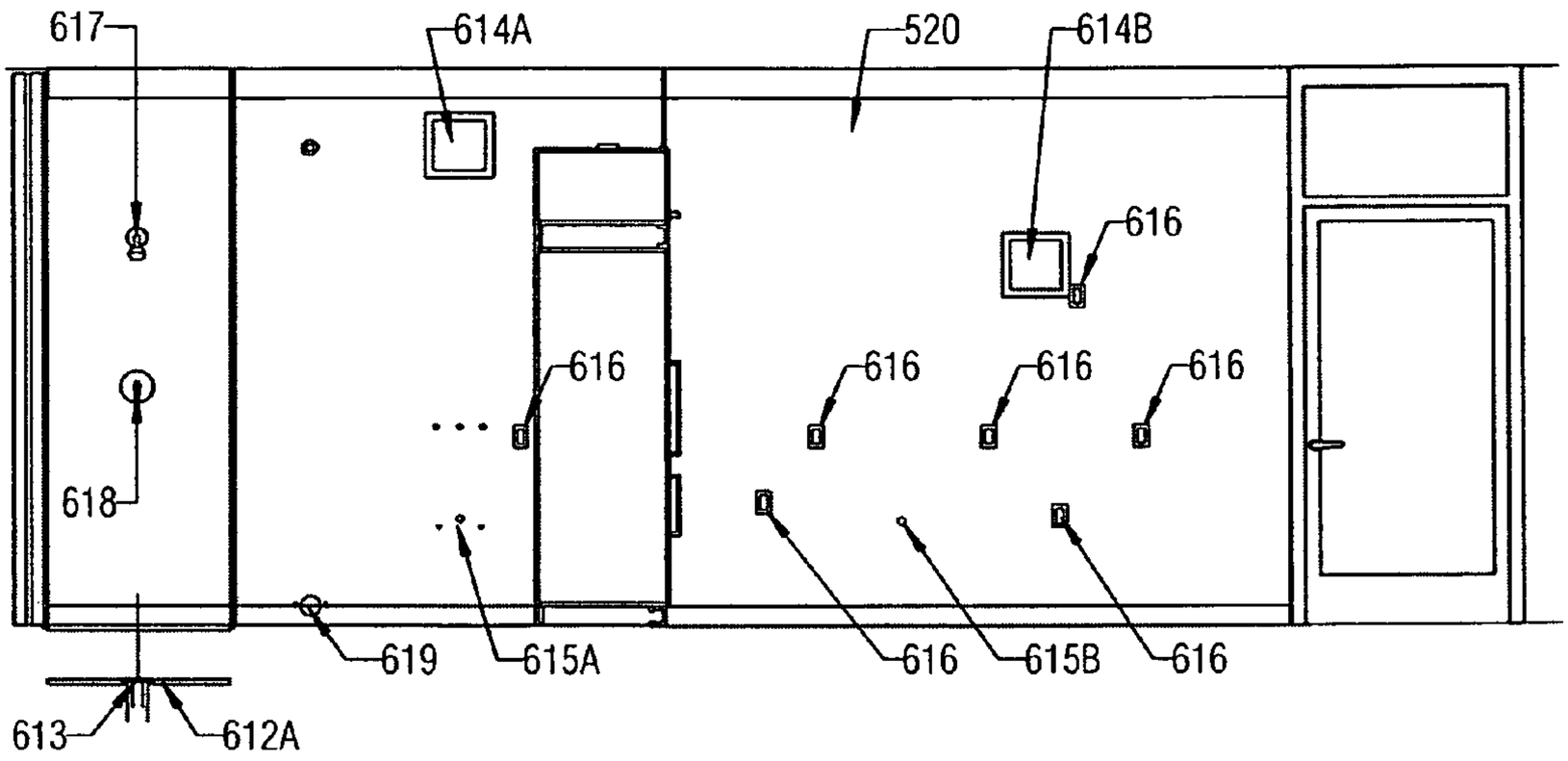


FIG. 32A

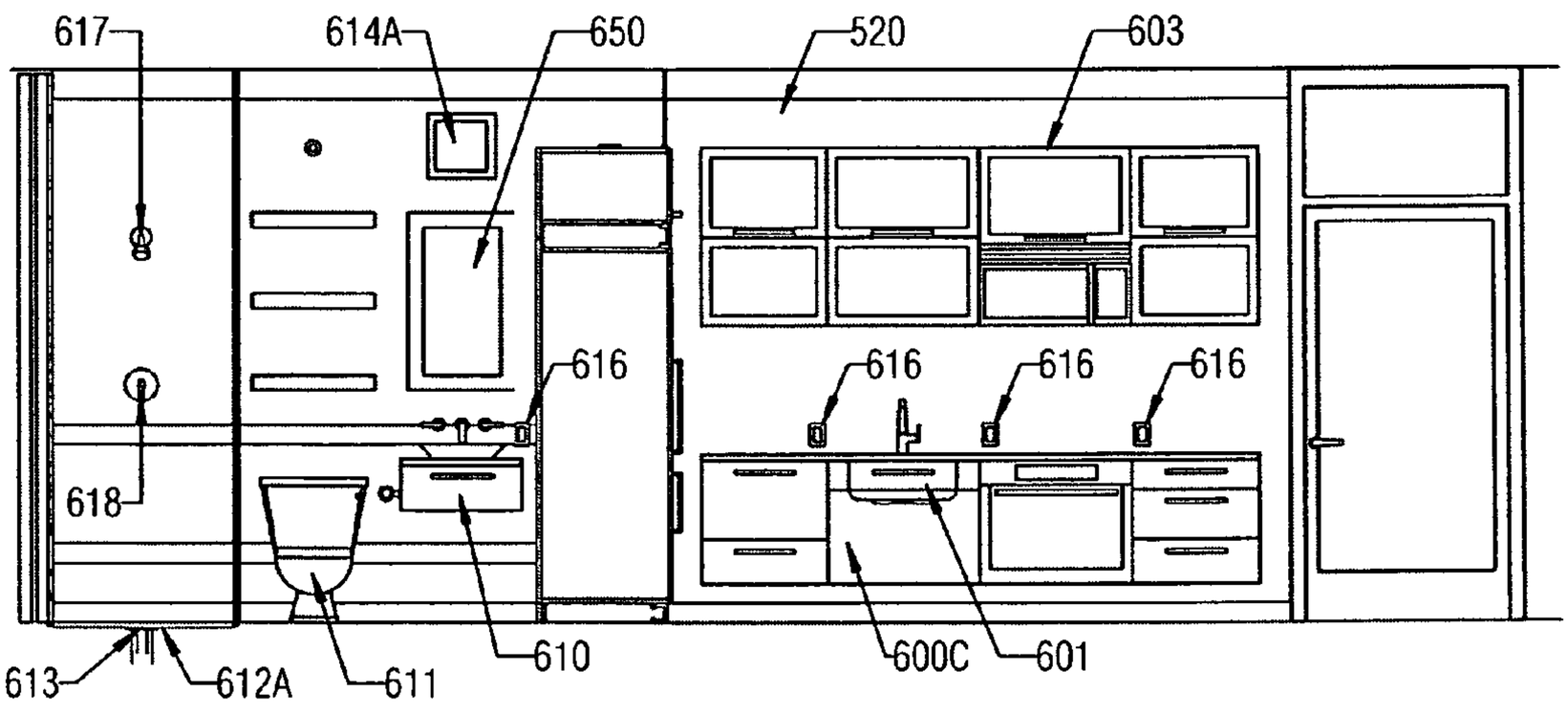
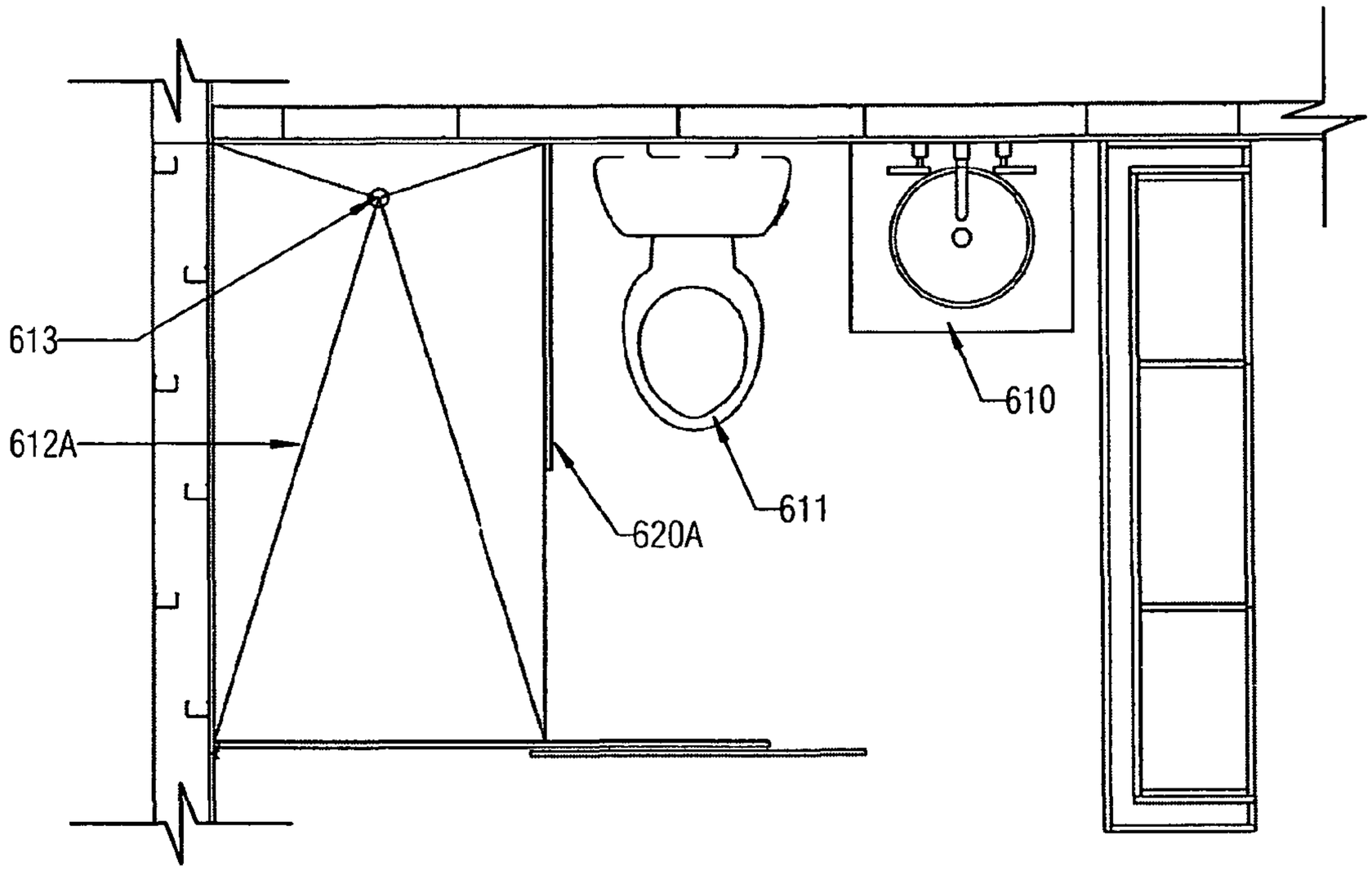
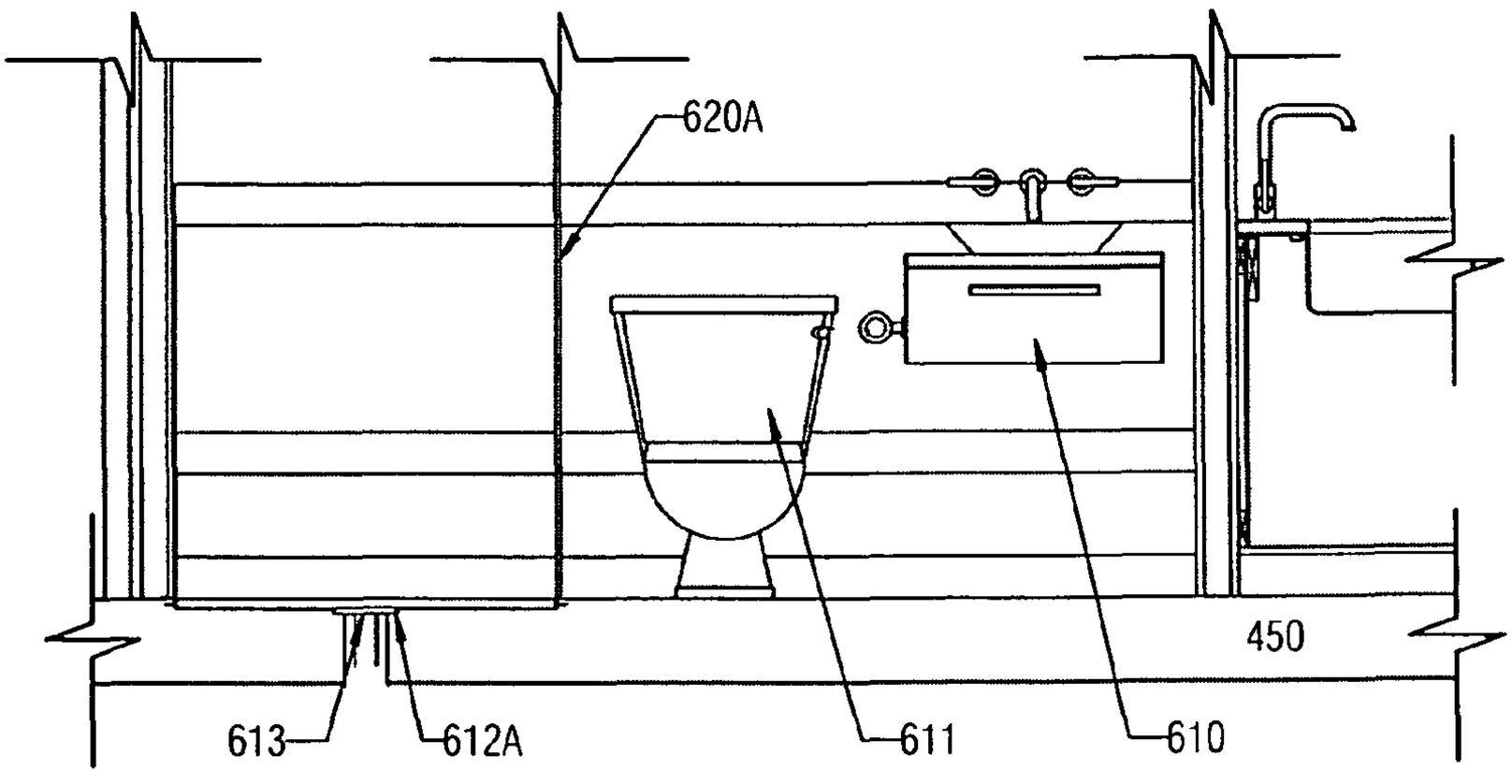


FIG. 32B



FLOOR PLAN

FIG. 33A



ELEVATION VIEW

FIG. 33B

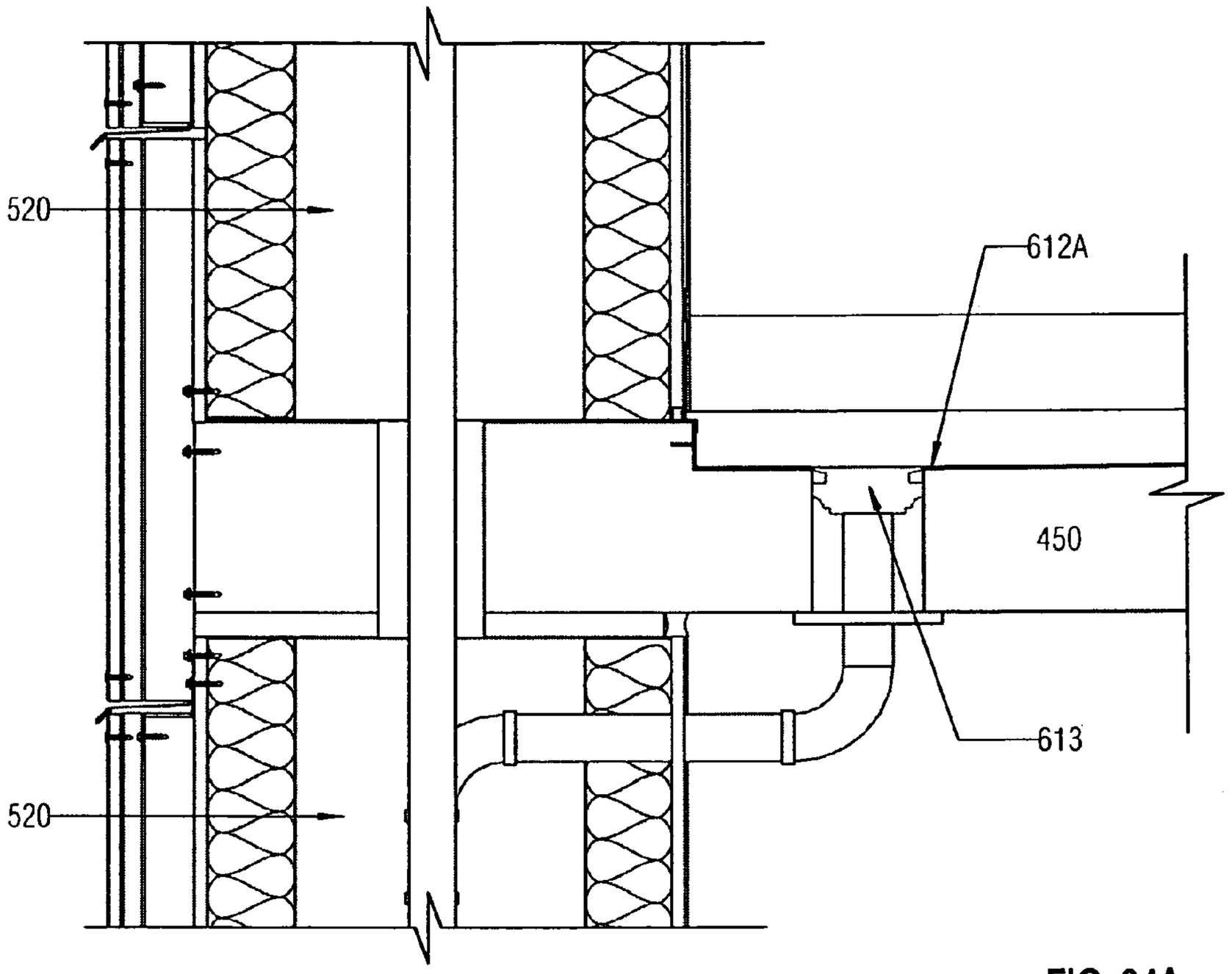


FIG. 34A

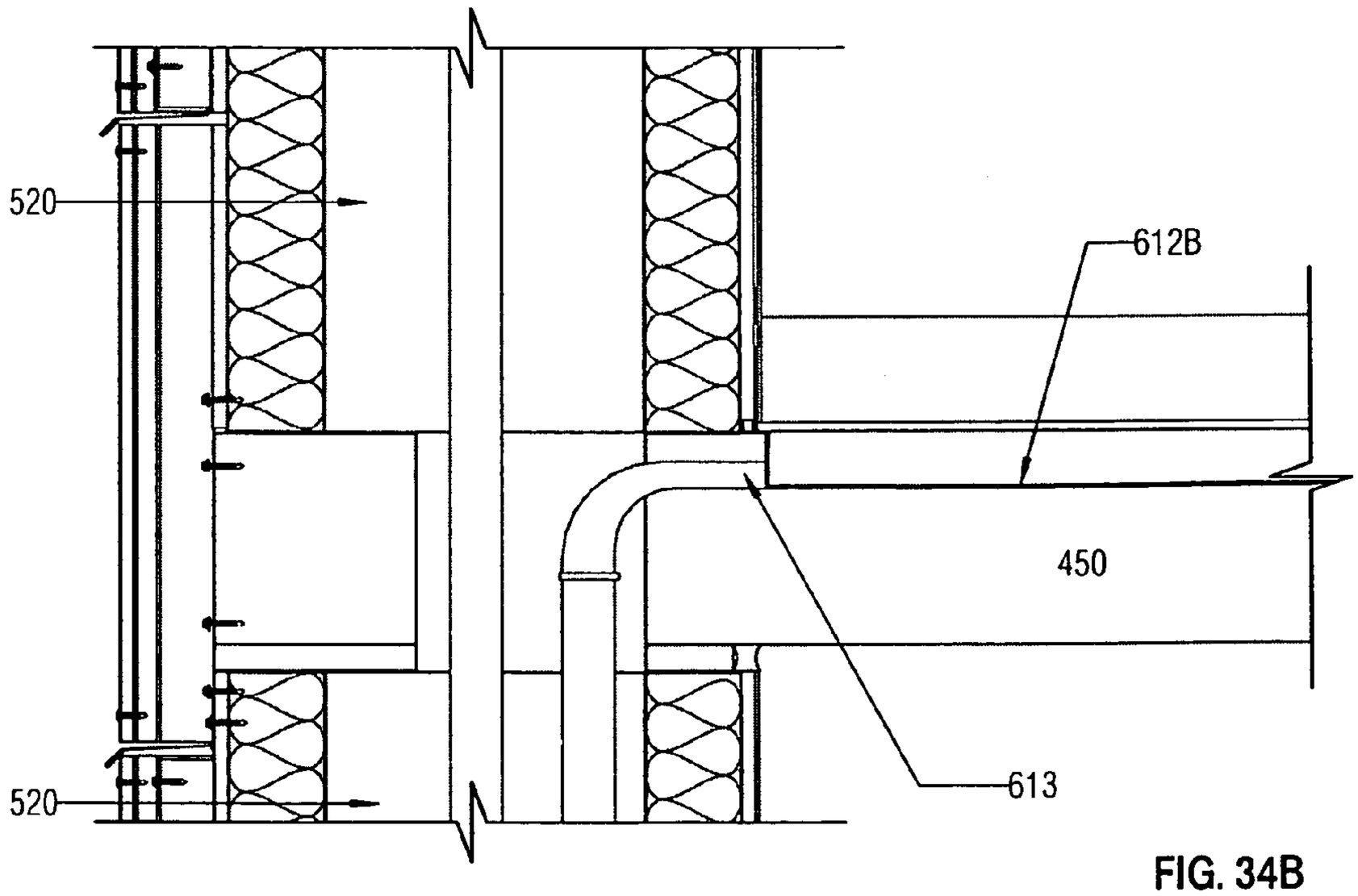


FIG. 34B

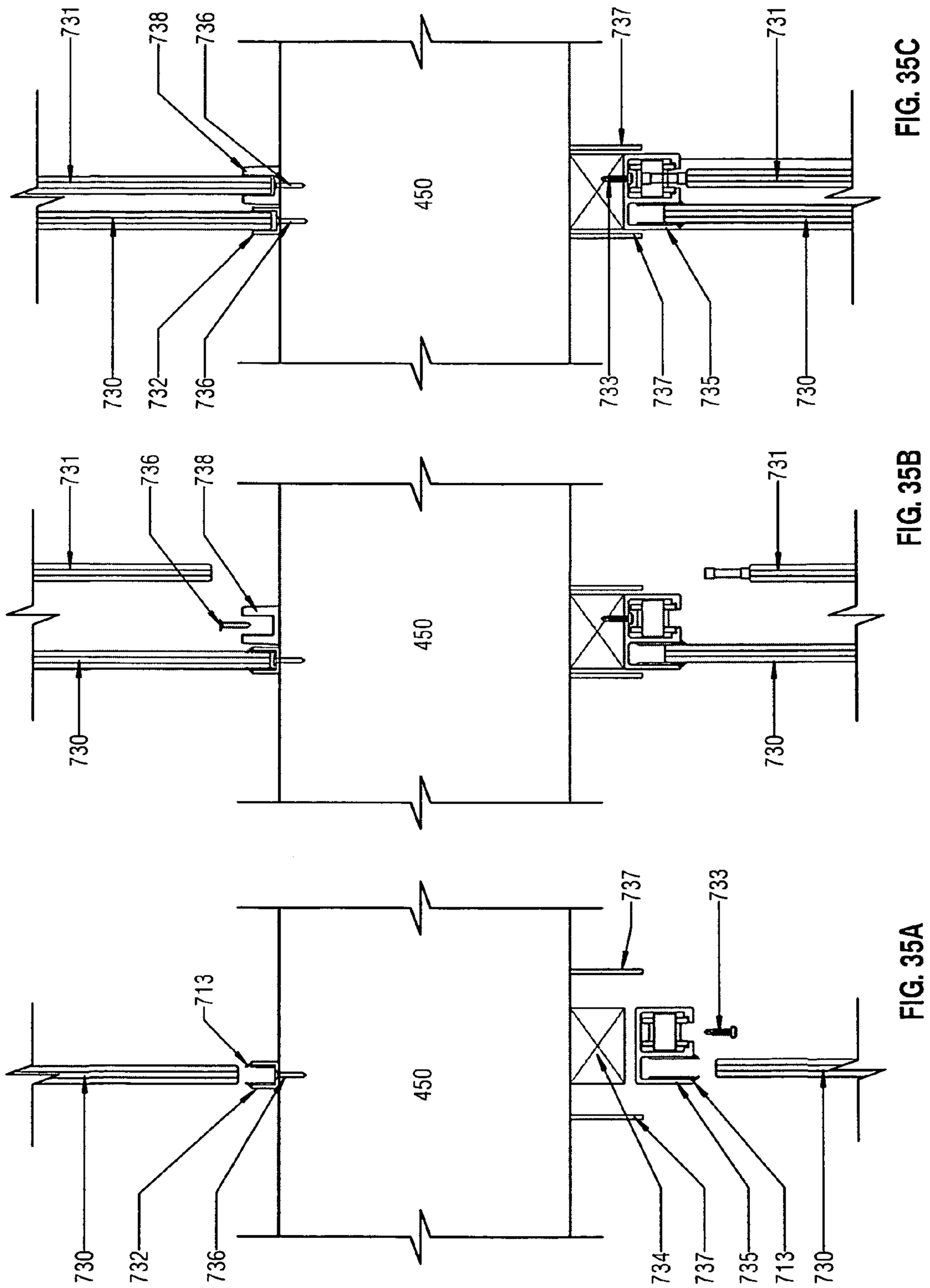


FIG. 35C

FIG. 35B

FIG. 35A

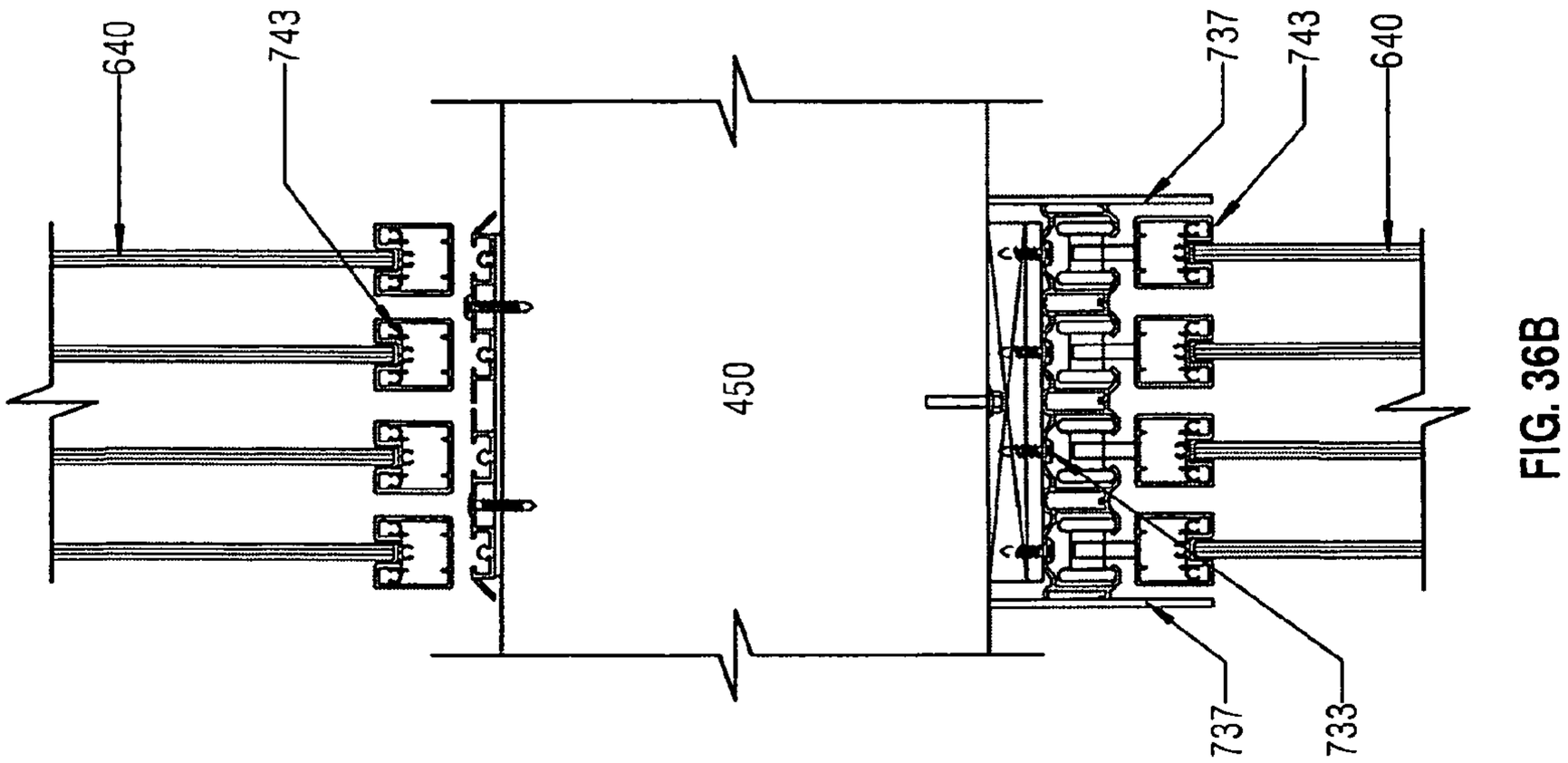


FIG. 36B

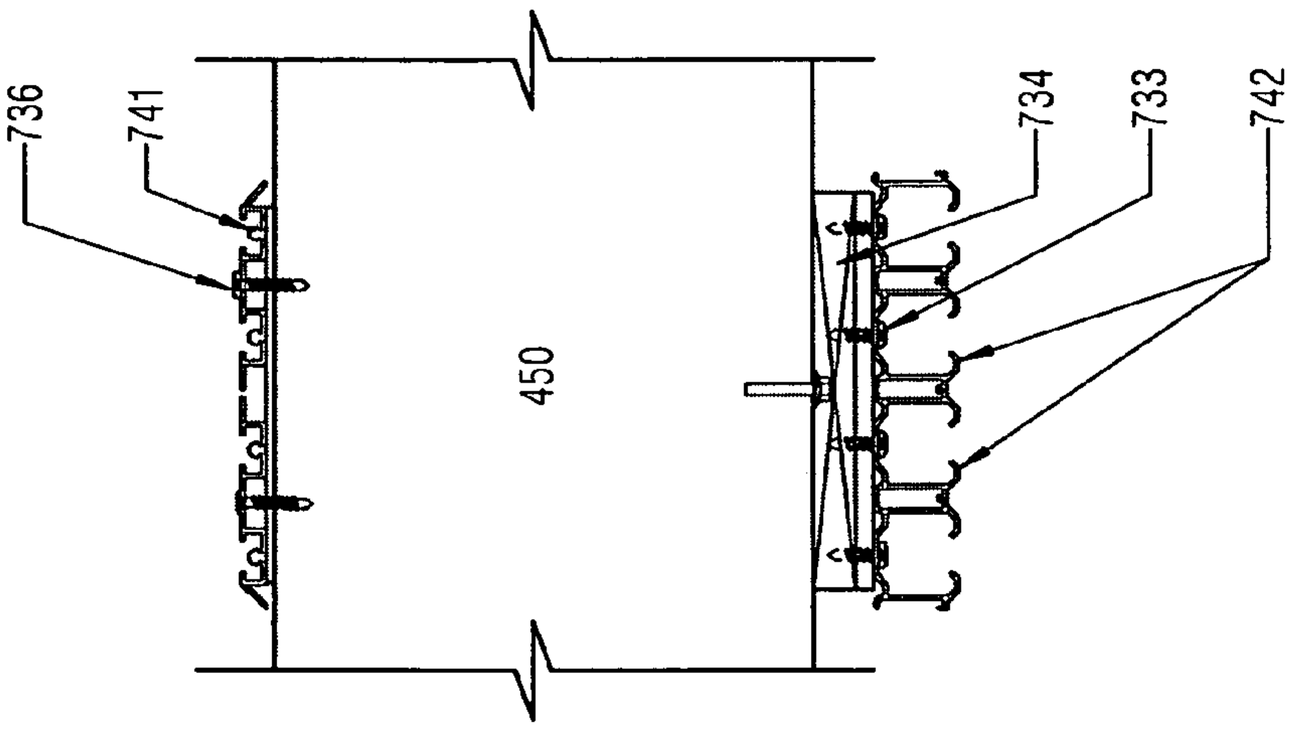


FIG. 36A

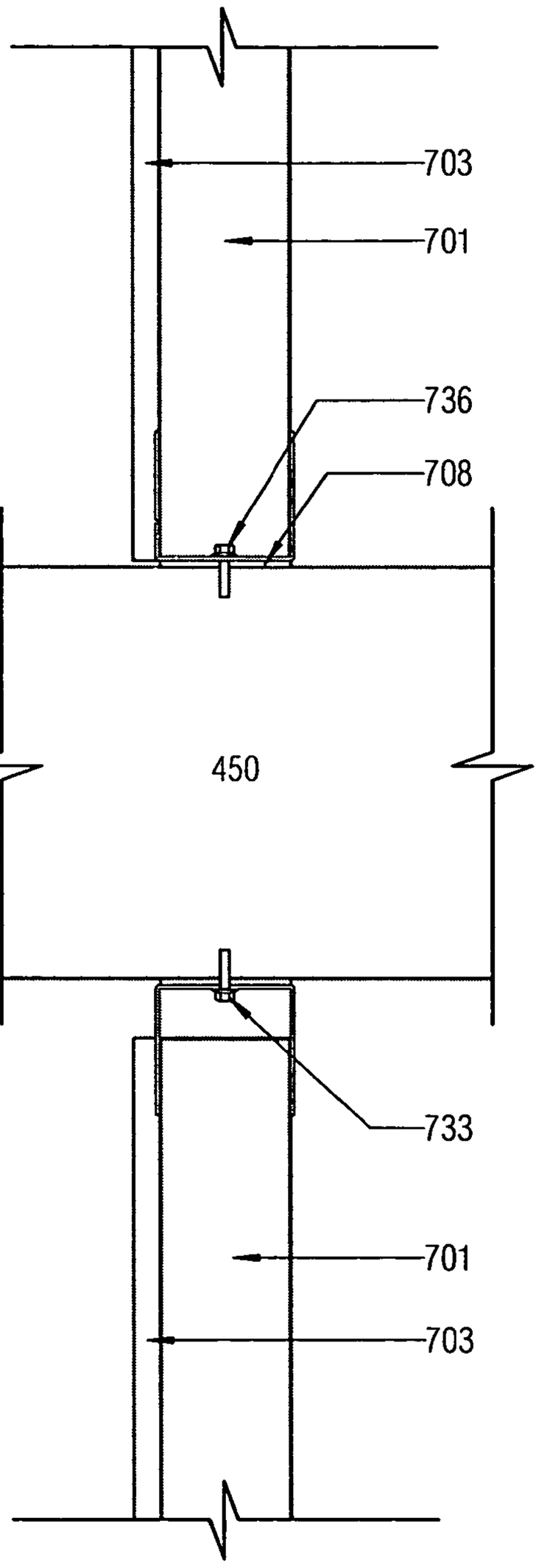


FIG. 37A

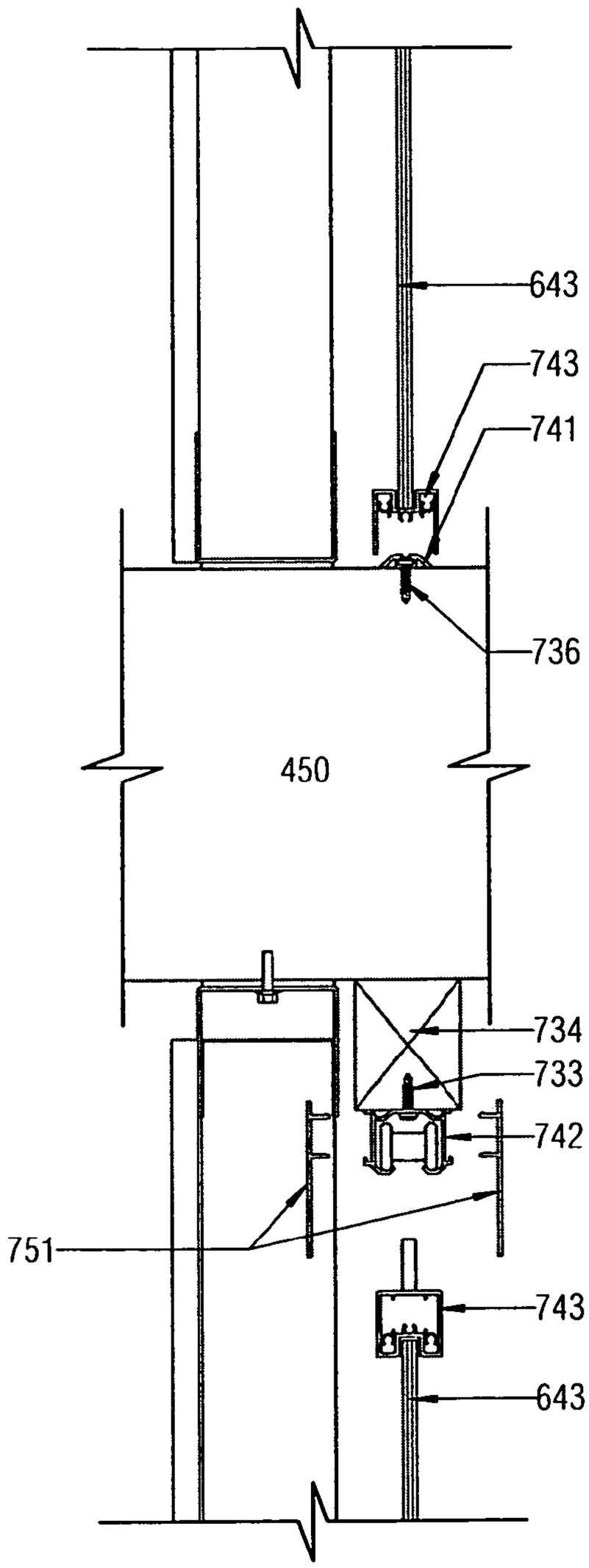


FIG. 37B

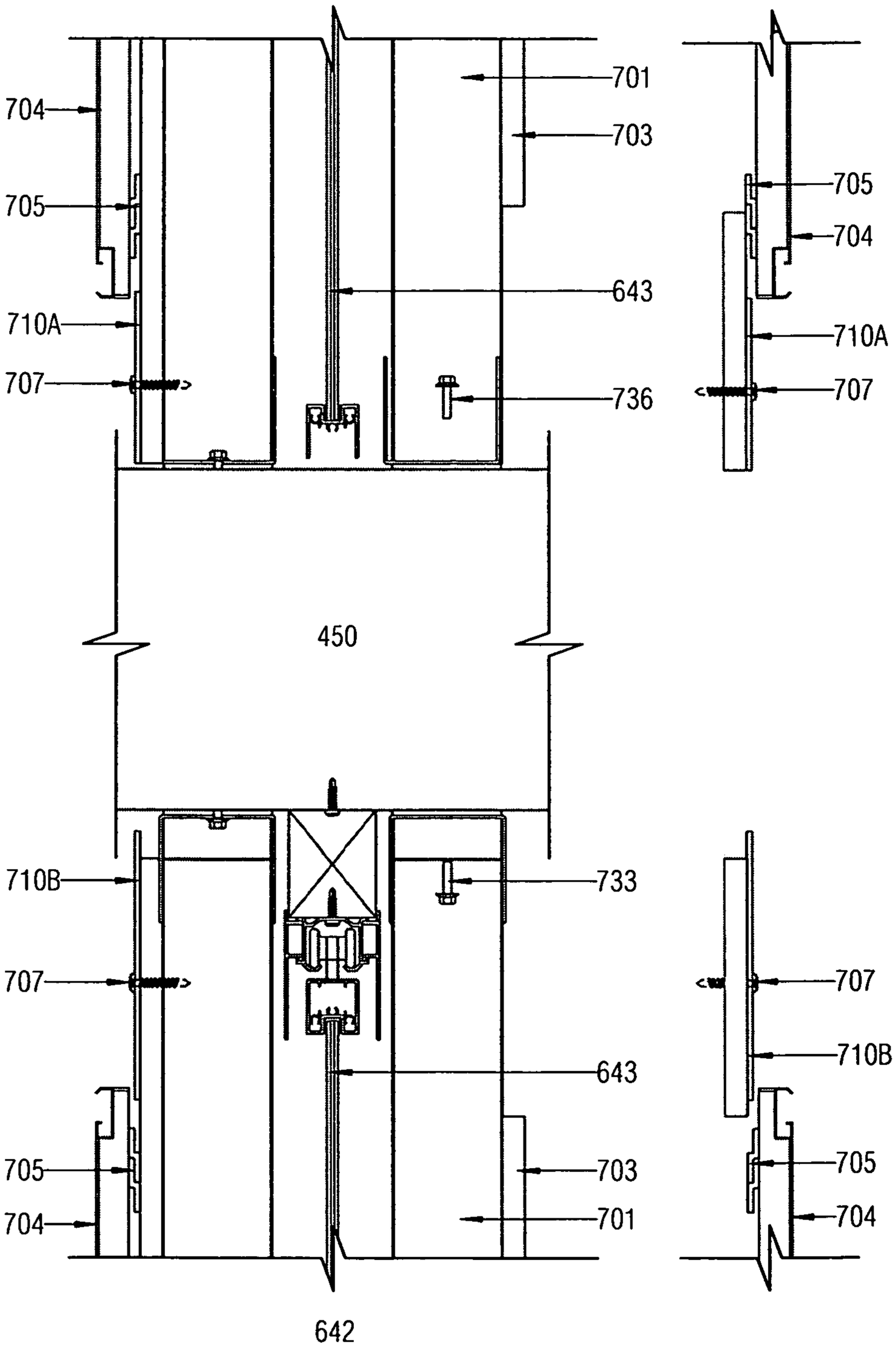

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FIG. 37C

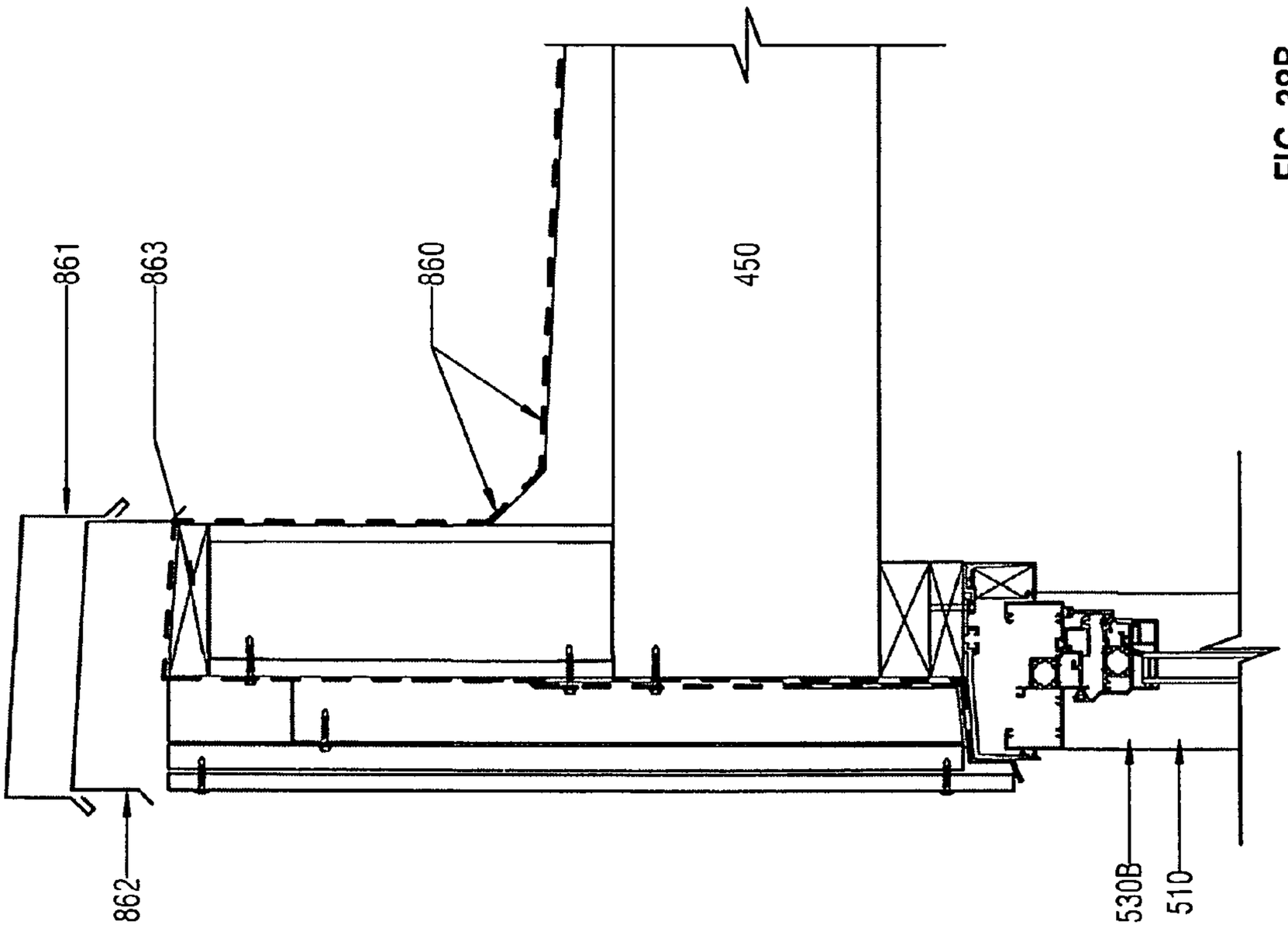

FIG. 38B

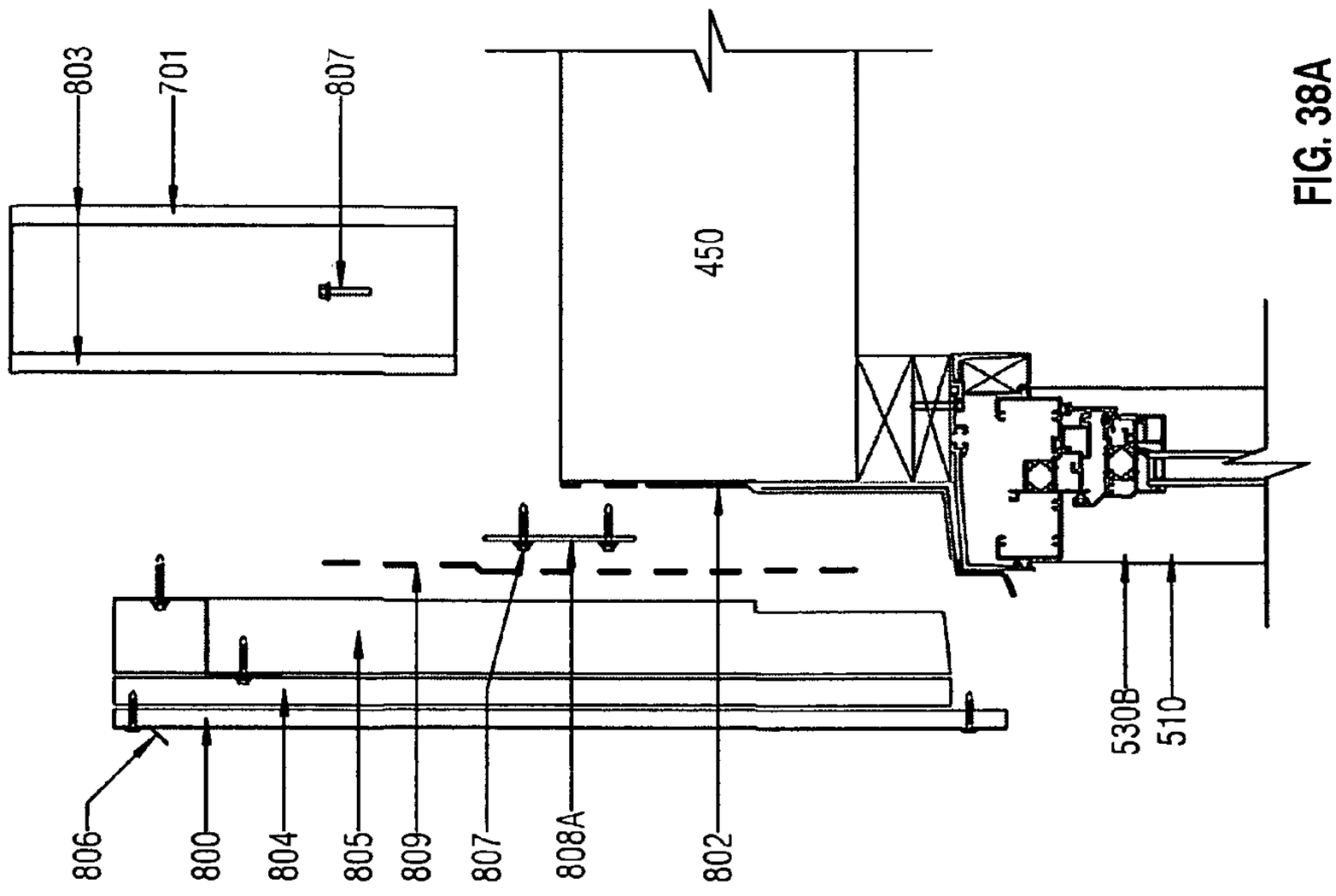

FIG. 38A

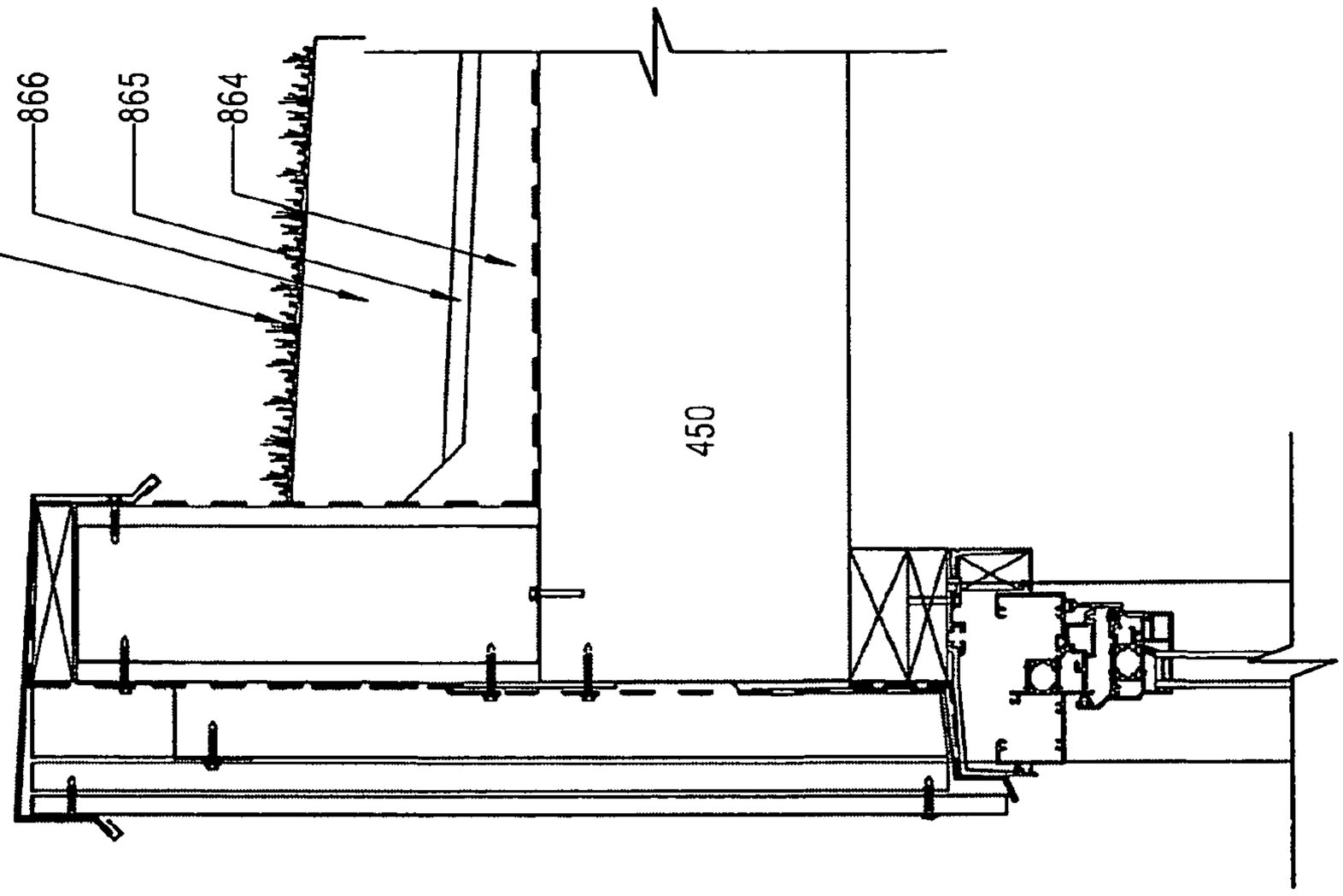

FIG. 39B

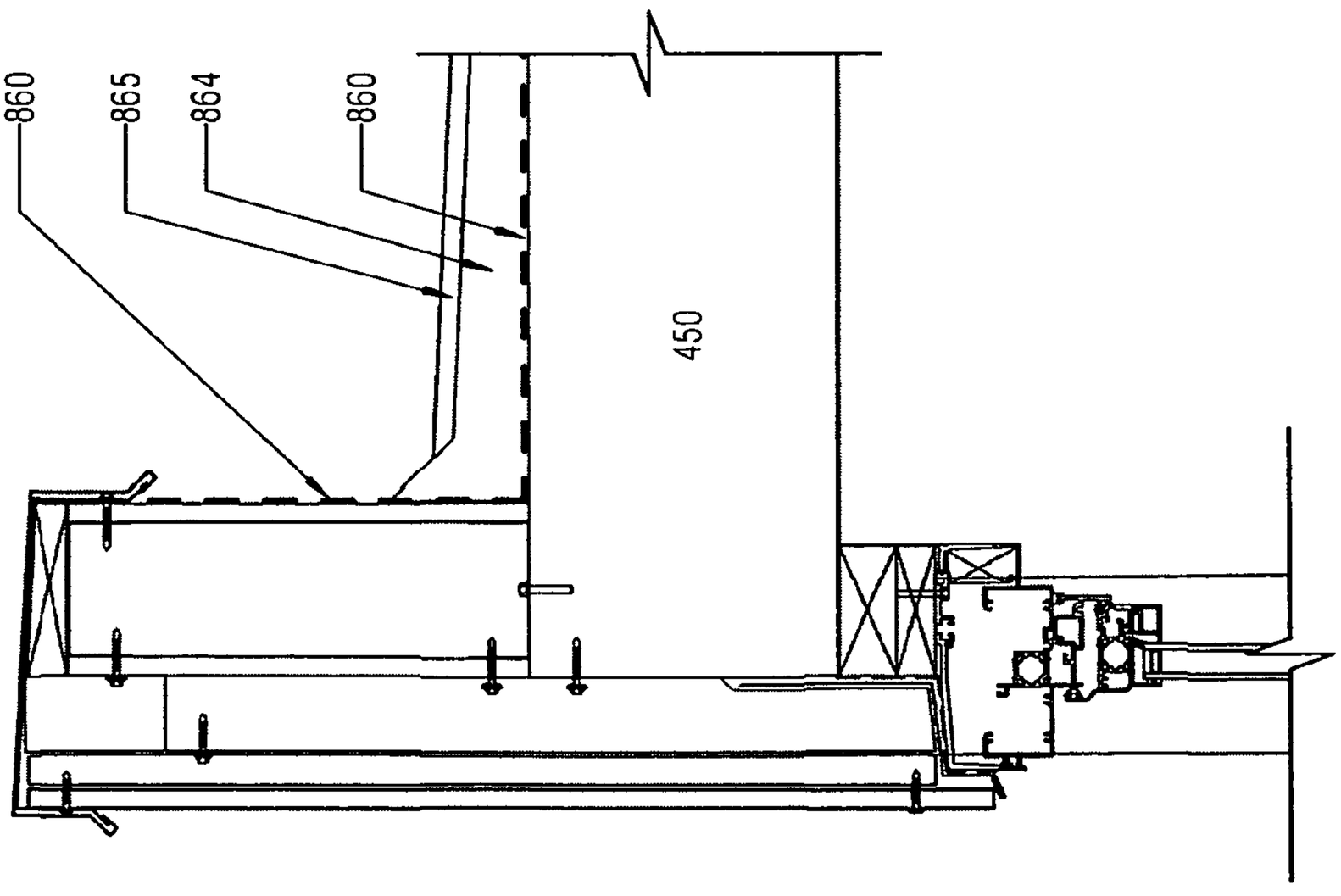

FIG. 39A

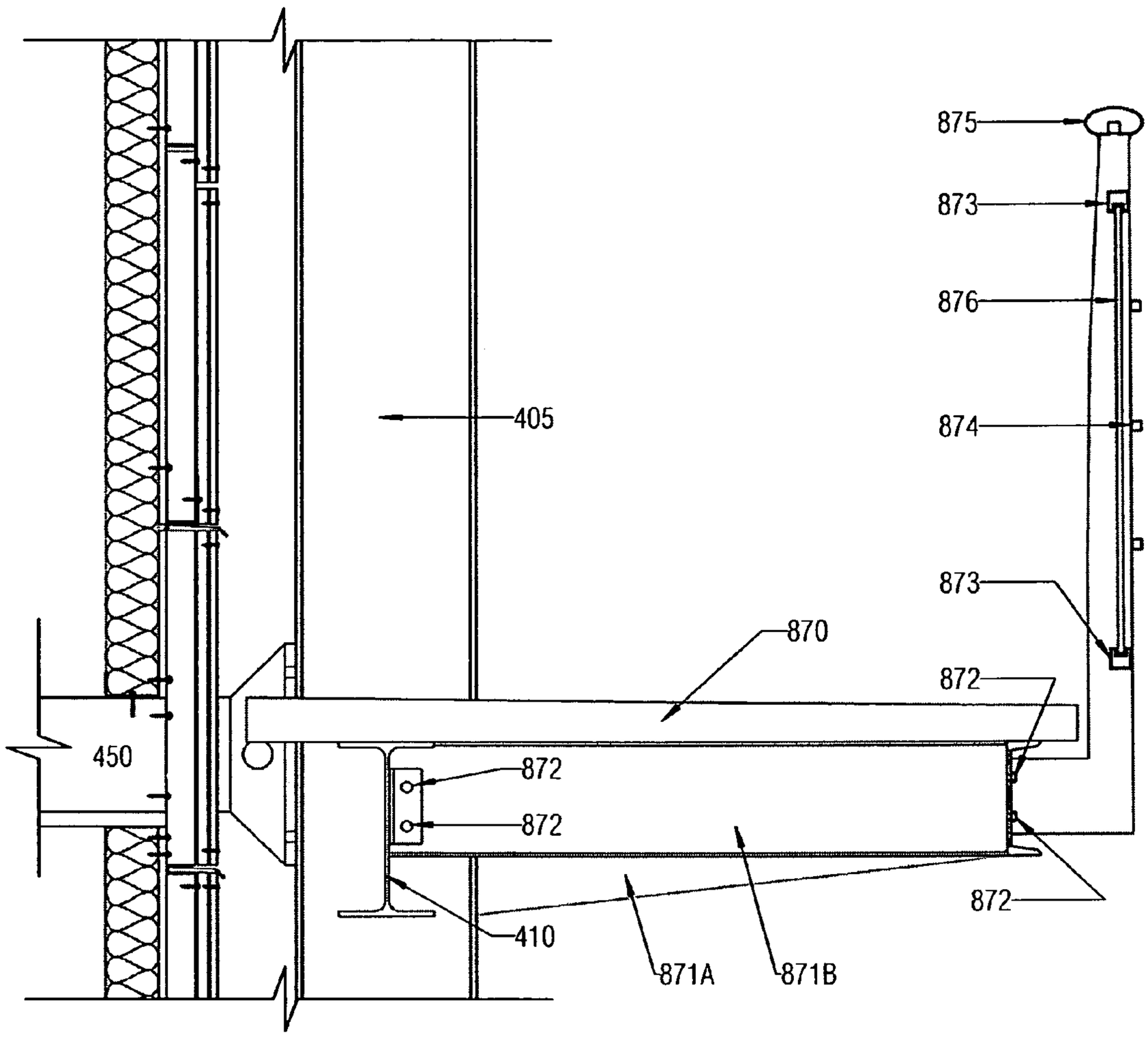

FIG. 40

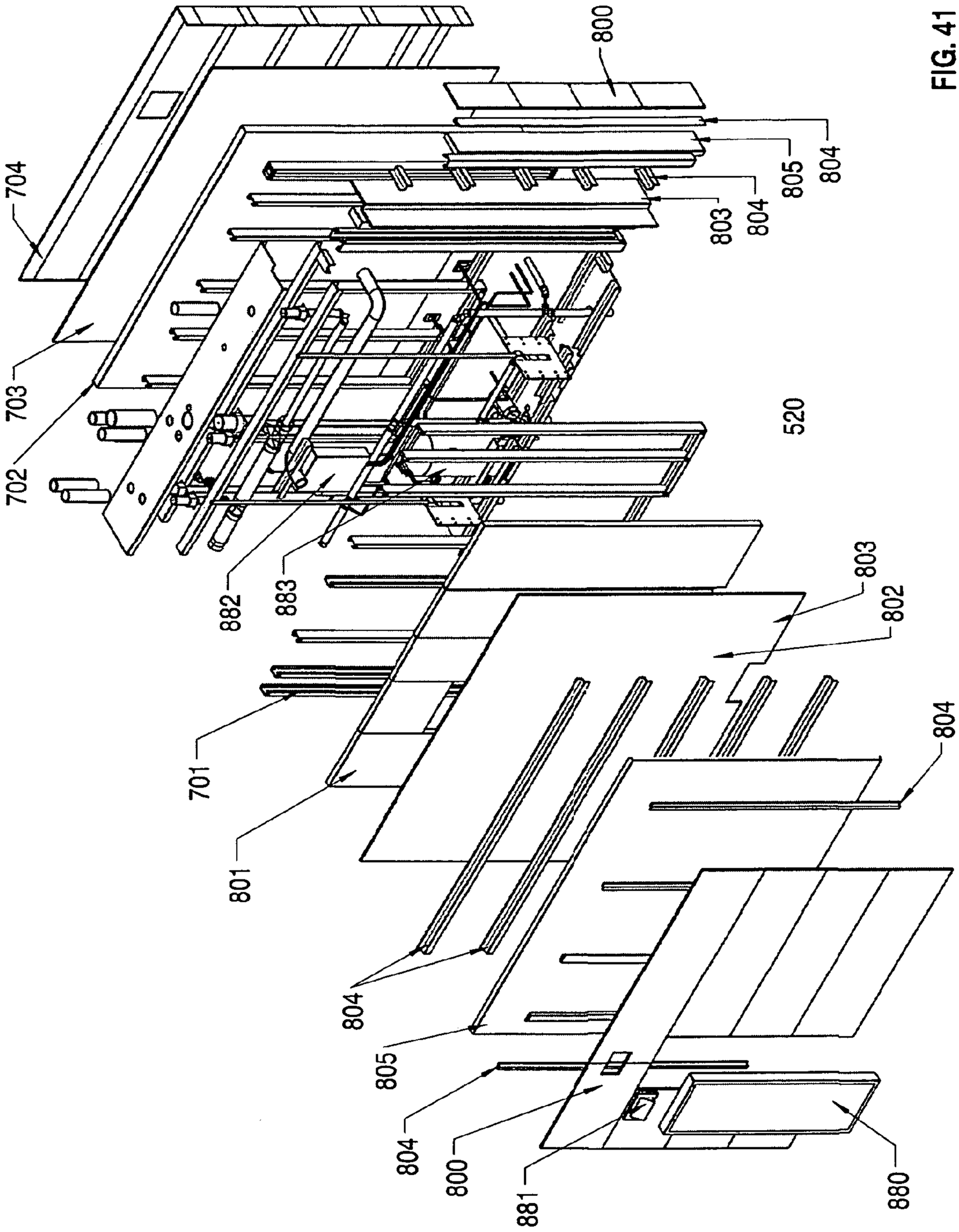
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FIG. 41

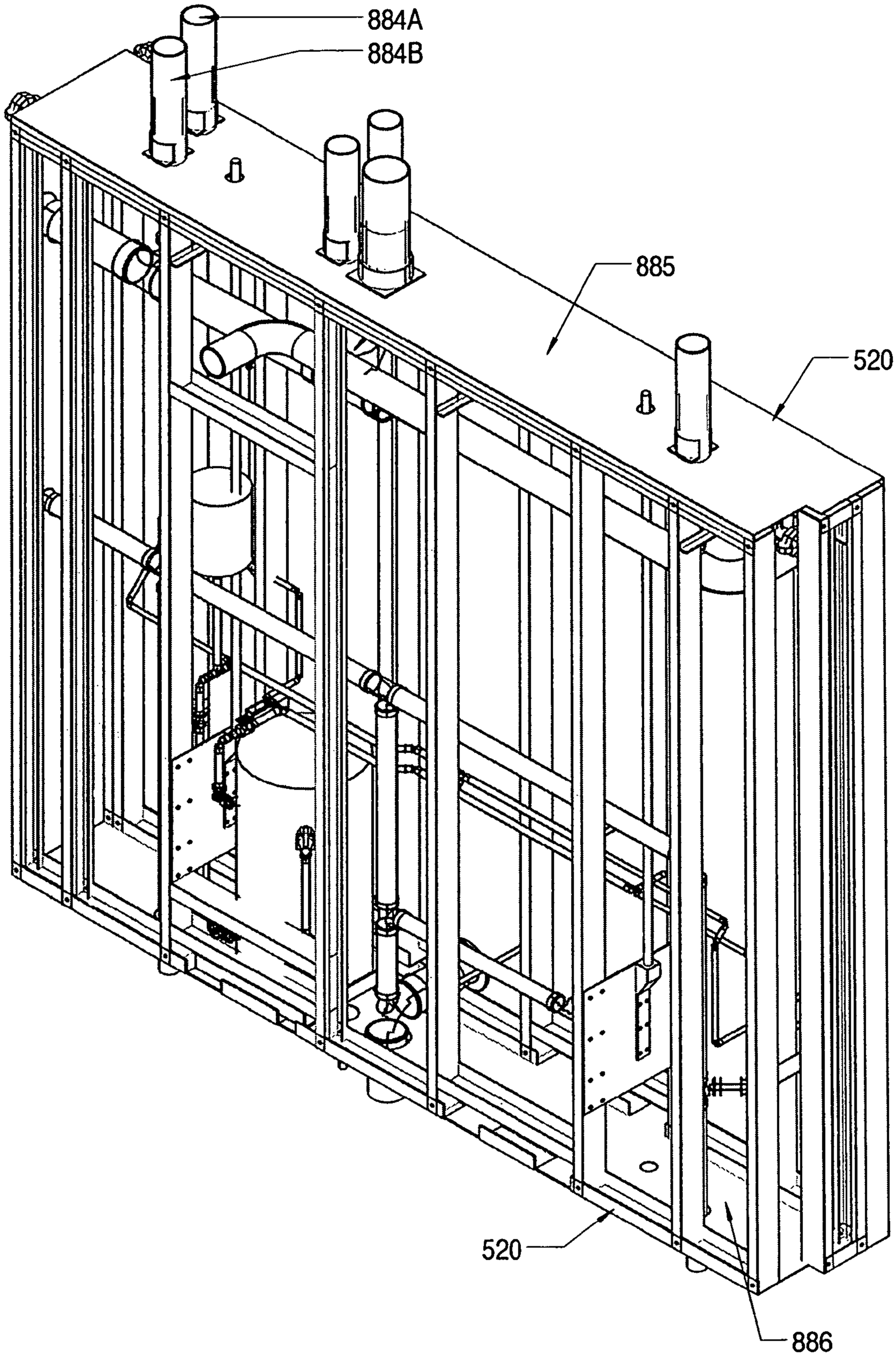

FIG. 42

SLAB CONSTRUCTION SYSTEM AND METHOD FOR CONSTRUCTING MULTI-STORY BUILDINGS USING PRE-MANUFACTURED STRUCTURES

CROSS-REFERENCE TO RELATED APPLICATIONS

The present application is a U.S. national stage filing under 35 U.S.C. §371 of International Application No. PCT/US2011/001039, filed on Jun. 7, 2011, which is a continuation-in-part under 35 U.S.C. §120 of U.S. patent application Ser. No. 12/796,625, filed on Jun. 8, 2010, now U.S. Pat. No. 9,027,307, titled "Construction System And Method For Constructing Buildings Using Pre-manufactured Structures," and is also is a continuation-in-part under 35 U.S.C. §120 of U.S. patent application Ser. No. 12/796,603, filed Jun. 8, 2010, now U.S. Pat. No. 8,950,132, titled "Pre-manufactured Structures For Constructing Buildings." The entirety of these applications are incorporated herein by reference.

FIELD OF THE INVENTION

The present invention relates generally to the construction industry, and relates more specifically to a lift-slab construction system and method for constructing multi-story buildings using pre-manufactured structures.

BACKGROUND OF THE INVENTION

Conventional pre-manufactured building construction has typically focused on single-story buildings or building room modules or components for incorporation into new or pre-existing building structures. Conventional pre-manufactured building structures have been promoted based on the purported cost, timing, and efficiency advantages of having construction pre-manufactured at manufacturing plants or factories prior to delivery and installation at a building site. Conventional pre-manufactured building structures may be delivered either as complete structures that require minimal installation, e.g., mobile homes, or may be partial building structures or components that require labor and costly on-site installation. Installation of these pre-manufactured structures generally occur using conventional construction techniques.

It is not always cheaper, faster and more efficient to pre-manufacture building structures at manufacturing plants or factories to be delivered to the building site for further installation and/or integration and finishing on-site. Handling of such structures can be extremely difficult, time-intensive and cost-prohibitive due to weight, bulk, and craning issues. Shipping modular structures or spaces can raise transportation issues due to weight and space problems. Due to the size of some building structures, transport may be inefficient as trucks may only fit one to two modules for delivery to a construction site. Huge cranes may be required to lift the modules to and from the trucks, or other transport means, at the manufacturing plants as well as at the building sites.

With regard to multi-story building construction, on-site construction is conventionally preferred over use of pre-manufactured constructs because pre-manufactured structures are not typically adapted for building multi-story structures.

Conventional lift-slab construction for building multi-story buildings involves the lifting of heavy slabs by strand jacks located on top of columns. After the slab is lifted into position, it must be secured to the supporting columns which are typically located underneath a lifted slab. Securing such lifted slabs requires construction workers to undesirably and unsafely engage in the dangerous activity of working underneath heavy unsecured slabs in order to adequately secure the slabs to the columns. Such unsecured slabs may fall and crush or kill persons located underneath the slab.

The present invention utilizes pre-manufactured structures together with a lift-slab building process to overcome the limitations of utilizing pre-manufactured structures when constructing multi-story buildings.

The present invention offers several advantages over known construction systems and methods in addition to adapting the concept of pre-manufactured structures for use in multi-story building construction.

Advantages of the present invention include increased ease and efficiency of construction, reduced construction time, reduced construction cost, minimal use of scaffolding, minimal use of field welding, safer construction, higher quality construction, construction of a consistent quality, the practice of more environmentally sound construction practices including "green" building construction, reduced maintenance costs, increased ease of access to intelligently designed building spaces for residential, institutional and/or commercial use, the ready ability to permit limited interior space and finishing details customization by the governments, municipalities, townships, builders, consumers, occupants and/or other purchasers or users of these buildings, the ready ability to manage the cost, delivery, timing, and experience expectations of governments, municipalities, townships, builders, consumers, occupants and/or other purchasers or users of these buildings due to the buildings' familiar and repeated pre-manufactured components and the ability to use experience gained by virtue of constructing other similar buildings in accordance with the present invention.

BRIEF SUMMARY OF THE INVENTION

The present invention integrates the use of pre-manufactured structures with minimal on-site installation and lift-slab construction to achieve the construction of multi-story buildings, while at the same time making building construction easier, more efficient, faster, cheaper, safer, of higher quality and consistency, environmentally advantaged, energy-efficient, easier to maintain, intelligently designed, and customizable. The buildings of the present invention also result in an enhanced building experience for all those involved in the purchase, construction and use of the buildings due, at least in part, to the ability to manage cost, delivery, timing, and experience expectations based on experiences garnered from other similar buildings constructed according to the present invention.

The present invention comprises a set of pre-manufactured structures designed for ready integration with each other and with limited on-site lift-slab construction. The present invention incorporates use of innovative lift-slab construction techniques. The pre-manufactured structures themselves are designed so that they may be arranged to create buildings and interior building units of various sizes and functionality. The pre-manufactured structures are designed so as to be readily integrated with both horizontal and vertically adjacent building components, including lift-slab components and/or other pre-manufactured structures, so that multiple building stories may be readily and securely stacked, one on top of the other. The pre-manufactured

components permit development of flexible design plans for institutional, residential, office and other types of buildings, and may be provided with various finish packages customized to order.

The pre-manufactured structures preferably involve the use of as many repetitive and self-sustaining construction methods and as many preassembled and prefinished structures as possible. Preassembled and prefinished structures are constructed in a manufacturing facility, transported to the construction site and installed within and/or on the lift-slab structure in conjunction with other components to create a fully finished, comfortable and weather-tight living environment. The present invention also contemplates use of semi- or largely prefinished components that may be fully and finally finished at the construction site. The pre-manufactured structures are preferably sized and packaged to eliminate wasted shipping space to facilitate efficiency of transport.

Standardizing the pre-manufactured structures and constructing them in a manufacturing facility provides the advantages of, among other things, reduced materials waste, reduced energy costs, quality control, faster production, consistent production, safer production, and increased labor productivity. The initial assembly of the components may eventually become automated. However, another advantage of the present invention is that construction may be carried out by less skilled labor under the supervision of qualified managers. Given that assembly will occur in an environmentally controlled setting, the potential for mold or materials damage due to exposure may also be reduced.

As will be explained in greater detail below, the lift-slab construction involving the pre-manufactured structures of the present invention provides for "top-down" construction. That is, once the building's foundation and any parking or floors below or at grade and the supporting external columns and/or beams are in place, the buildings of the present invention may be built from the top down, starting with the roof and moving sequentially down through each level until construction is complete. Roof slabs and floor slabs are lifted into place using multiple strand jacks located on top of the external columns and/or beams. The external columns and/or beams may be located around the exterior perimeter of the building slabs. Once a slab is lifted into place, connections located at the slab edge are used to secure the slab to the external columns and/or beams. The slab may be connected by various means, including but not limited to, bolted or pinned connections and/or the use of welding. The preferred method of the current invention is the use of bolts and/or pins to secure the slabs to the columns and/or beams to allow for an efficient and quick installation method. The slabs may be readily secured to the external columns and beams via access created by the exterior walkways of the present invention, or by using a man-lift or other similar means. This means of connection eliminates the potential unsafe and hazardous activity of workers being underneath an unsecured slab as utilized in previous conventional lift-slab construction.

The present invention advantageously reduces, and in some cases, completely eliminates the need for exterior scaffolding. The exterior walkways are utilized for access to the utility walls, while the window walls are securely attached to the lifted slabs from the interior of the unit. The end walls at each end of a multi-story building are the only location where exterior scaffolding might be necessary. This need can potentially be eliminated if the end walls are fully prefinished with the exterior components installed prior to being set in place. In this case, a man-lift or other similar means may be used to install final panels to the exterior wall. The lift-slab construction system also reduces, and in some cases, largely eliminates the need for construction cranes. By reducing the need for, and or eliminating entirely, the need for scaffolding and construction cranes, the present invention significantly and advantageously reduces the time and costs involved in multi-story building construction. Furthermore, the present invention limits or eliminates the time consuming and costly practice of field welding. The structural steel may arrive at the site shop welded where necessary and ready for installation. All field connections, whether between the structural members themselves, or between the structural steel and the floor slab, may be bolted and/or pinned connections.

The present invention's top-down lift-slab construction beneficially provides enclosure of the buildings from roof to grade during construction, thus protecting the building's interior space and construction workers from the elements such as rain, snow and wind. Construction of the multi-story building from the top-down also increases the security and safety of partially constructed multi-story buildings as access to the upper building floors is limited during construction. Further, the present invention also permits multiple construction crews to be actively working on completing building construction with, for example, one crew finishing installation and/or final finishing of pre-manufactured building structures on floor slabs that have been secured into place and another crew dedicated to preparing floor slabs and/or pre-manufactured structures to be lifted.

The present invention may reduce construction time by approximately 50%, or one-half. That is, a building constructed according to the present invention that has about 100 units on five or six floors, may be completed in six (6) to eight (8) months from the podium level to the roof. By contrast, construction of a similarly sized building using conventional construction techniques would be expected to take about twelve (12) to sixteen (16) months. The present invention is well-suited for the construction of many types of multi-story buildings, including mid-rise buildings.

The present inventions comprises, in no particular order: pre-manufacturing a plurality of finished, or mostly finished, non-weight bearing walls; pre-manufacturing a plurality of finished, or mostly finished, interior components adapted to connect to the non-weight bearing walls; pre-manufacturing finished, or mostly finished, exterior components adapted to attach to the exterior building surfaces; transporting the pre-manufactured non-weight bearing walls, interior components, and exterior components to a building site; preparing a multi-story building foundation at the building site to support a plurality of load-bearing structural columns and/or beams; forming a plurality of floor slabs and a roof slab to attach to the structural columns and/or beams at each building level; constructing the load-bearing structural columns and beams at the building site; lifting the roof slab and each floor slab to attach to structural columns and/or beams at each level; installing stairs and elevators which attach to the structural columns, beams and/or slabs; installing the non-weight bearing walls and the interior components at each building level; and installing the plurality of exterior components on exterior building surfaces. The non-weight bearing walls, interior components, and exterior components are assembled and installed to provide the multi-story building with the plurality of units which may be identical or have different floor plans and may, optionally, include a retail level with amenity space and underground parking.

The present invention may be used to construct various buildings with a plurality of institutional, office, commer-

cial, and/or residential units including, for example, studio units, one or multiple bedroom units, and/or a mix of such units.

The non-weight bearing walls of the present invention may include: demising walls that are pre-manufactured, pre-wired, pre-plumbed, prefinished, pre-bundled, preassembled, and may include preassembled sections, electrical wiring and electrical radiant heat, acoustic insulation, studs for framing, fire rated sheathing, interior finish material, and may include plumbing for sprinklers; end walls that are pre-manufactured, pre-wired, pre-plumbed, prefinished, pre-bundled, preassembled, and may include preassembled sections, electrical wiring and electrical radiant heat, acoustic insulation, studs for framing, fire-rated sheathing, interior finish material, vapor barrier, thermal insulation, fire rated exterior sheathing, weather resistive barrier, an exterior cladding system, and may include plumbing for sprinklers; exterior walls that are pre-manufactured, pre-wired, pre-plumbed, prefinished, pre-bundled, preassembled, and may include preassembled sections, electrical wiring and electrical radiant heat, acoustic insulation, studs for framing, fire-rated sheathing, interior finish material, vapor barrier, thermal insulation, fire rated exterior sheathing, weather resistive barrier, an exterior cladding system, and may include plumbing for sprinklers and an optional window or door; utility walls that are pre-manufactured, pre-wired, pre-plumbed, prefinished, pre-bundled, preassembled, and may include features that permit stacking of the utility walls, heating, ventilating, and air conditioning (HVAC), electrical and communications wiring for adjacent walls, an electrical service panel, kitchen and bath plumbing, including kitchen and/or bath supply and waste lines and vent ducting, exhaust vents/fans and vent trims, and toilet mounting support with a water-resistant, interior surface, interior sheathing, vapor barrier, acoustic insulation, plumbing chase, studs for framing, exterior sheathing, weather resistive barrier, and an exterior cladding system; and exterior window walls that are pre-manufactured, prefinished, preassembled, pre-bundled and that may be pre-glazed and pre-bundled with a unitized wall system, and may include windows, insulation, insulated aluminum or glass and weather seal. Optionally, pre-manufactured, pre-wired, prefinished and preassembled ceiling panels that may include electrical wiring and acoustical paneling may also be used as part of the present invention. Each of the above components may also be pre-manufactured so as to be only partially prefinished and/or preassembled, with complete finishing and assembly to be done upon or after installation.

The present invention may optionally incorporate several environmentally friendly and/or green building practices. The present invention may utilize recycled products and materials, use low volatile organic compounds (VOC) finishes for improved indoor air quality, provide an abundance of natural day lighting for user comfort and well-being, provide operable windows for natural cross ventilation, incorporate use of alternative energy sources such as solar panels and wind powered turbines, provide solar thermal panels for domestic hot water and radiant heating, aid water and collection retention with green and vegetated roofs and water cisterns, utilize gray water recycling methods, provide water features and landscaping within the courtyard, and may increase cooling by introduction of green walls. The present invention optionally includes the use of external rain screen system on the building itself. The rain screen system may be located directly adjacent to the building exterior and or may include an air gap of, for example, between about 1" to 3," between the insulation and the cladding to allow for air movement within the cavity to provide a means of drying potential moisture behind the cladding material. The external cladding may be comprised of various materials allowed by code, such as, but not limited to, composite panels, phenolic resin panels, metal panels, cement board, lightweight precast concrete panels, wood siding, gypsum fiber reinforced cement panels, ceramic tile, and stone panels, and may be attached to metal or wood furring channels set apart from the insulation with an air gap.

The precise sequence of steps involved in the lift-slab method used to produce a multi-story building according to the present invention may be re-ordered and executed in various different sequence steps, including, for example, those methods disclosed in U.S. patent application Ser. Nos. 12/796,625 and 12/796,603, the contents of which are fully incorporated by reference herein.

The methods and sequence of construction steps disclosed in connection with production of identical unit and mixed unit residential buildings described in detail immediately below are provided as exemplary embodiments of the present invention only and are, in no way, intended to be limiting.

One method of constructing a multi-story building with a plurality of units comprises: (a) pre-manufacturing a plurality of non-weight bearing walls with a finished exterior including all electrical, insulating, plumbing and communications components; (b) pre-manufacturing a plurality of interior components adapted to connect to the non-weight bearing walls; (c) pre-manufacturing a plurality of exterior components adapted to attach to the building's exterior surfaces; (d) transporting the non-weight bearing walls, the interior components, and the exterior components to a building site; (e) preparing a multi-story building foundation at the building site to support a plurality of load-bearing structural columns and/or beams; (f) forming and pouring a plurality of floor slabs and a roof slab to attach to the structural columns and beams at each building level; (g) constructing the load-bearing structural columns and/or beams at the building site; (h) installing the exterior walkways to the structural columns and/or beams; (i) installing stairs and elevators to attach to the structural columns, beams and/or slabs; (j) loading the plurality of exterior components on the first slab; (k) lifting and securing the first slab from the poured slabs up to top of the building; (l) loading the plurality of non-weight bearing walls, the interior components, and the exterior components to the second slab; (m) lifting and securing the second slab to the structural columns and beams forming the top floor; (n) repeating steps (l) through (m) until all building levels are completed; (o) installing exterior components on exterior building surfaces; (p) installing demising walls in a direction perpendicular to the longitudinal direction of the slab and partially enclosing each of the units; (q) installing end walls on the exterior sides of the units at building's ends in a direction parallel to the demising walls and partially enclosing each of the units located at the building's ends; (r) installing utility walls on the interior sides of the units in a perpendicular direction interfacing with the demising walls and connecting with the demising walls to partially enclose each of the units; (s) installing exterior window walls on exterior sides of the units and substantially enclosing each of the units; (t) installing entry doors in line with the utility walls and completely enclosing each of the units; (u) installing kitchen and bathroom components to the utility walls; and (v) installing interior partitions within each of the units for separating rooms and configuring each of the units. Using this method of construction, the non-weight bearing walls,

the interior components, and the exterior components may be assembled and installed to provide the multi-story building with units having identical or different floor plans and, optionally, a retail level with underground parking.

Another method of constructing a multi-story building with a plurality of units comprises: (a) pre-manufacturing a plurality of non-weight bearing walls with a finished exterior including all electrical, insulating, plumbing and communications components; (b) pre-manufacturing a plurality of interior components adapted to connect to the non-weight bearing walls; (c) pre-manufacturing a plurality of exterior components adapted to attach to the building's exterior surfaces; (d) transporting the non-weight bearing walls, the interior components, and the exterior components to a building site; (e) preparing a multi-story building foundation at the building site to support to a plurality of load-bearing structural columns and/or beams; (f) forming and pouring a plurality of floor slabs and a roof slab to attach to the structural columns and beams at each building level; (g) constructing the load-bearing structural columns and/or beams at the building site; (h) installing stairs and elevators to attach to the structural columns, beams and/or slabs; (i) installing exterior roof components on the top slab surface; (j) lifting and securing the first slab from the poured slabs up to top of the building; (k) installing the non-weight bearing walls other than exterior window walls and some of the interior components on a second slab located beneath the first slab; (l) loading the exterior window walls and rest of the interior components on the second slab; (m) lifting the second slab with the non-weight bearing walls and the interior components whether installed or loaded to the floor level immediately beneath the first slab; (n) attaching the second slab securely to load-bearing structural columns and/or beams to form a top floor; (o) installing the remaining non-weight bearing walls, exterior window walls, the rest of the interior components on the second slab to complete the top level; (p) repeating steps (k) through (o) until all building levels are secured. Using this method of construction, the non-weight bearing walls, the interior components, and the exterior components may be assembled and installed to provide the multi-story building with units having identical or different floor plans and, optionally, a retail level with underground parking.

The foregoing and other objectives, features, and advantages of the invention will be more readily understood upon consideration of the following detailed description of the invention, taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

The accompanying drawings, which are incorporated in and constitute a part of this specification, illustrate various exemplary embodiments.

FIG. **1** illustrates a multi-story building according to an embodiment of the present invention.

FIGS. **2**A-B illustrate a building plan with various unit layouts of FIG. **1**.

FIG. **3** illustrates a side elevation view of the multi-story building.

FIG. **4** illustrates a side sectional view of an exemplary portion of the multi-story building of FIG. **3**.

FIGS. **5**A-B illustrate a floor plan of an exemplary portion of the various floor plans of FIG. **1**.

FIGS. **6**A-B illustrate various embodiments of a single unit for the building of FIG. **1**.

FIG. **7** illustrates the structural framing of the multi-story building of FIG. **1**.

FIG. **8** illustrates the structural framing of the multi-story building of FIG. **1** for the floor and roof assembly before the floor slabs and roof slab are assembled into place.

FIG. **9** illustrates the structural framing of the multi-story building of FIG. **1** for the floor and roof assembly after the floor slabs and roof slab are assembled into place.

FIGS. **10**A-B illustrate a components plan of an exemplary efficiency studio unit for various walls and components before and after assembly.

FIGS. **11**A-F illustrate a perspective view of different phases of assembling an exemplary efficiency studio unit.

FIGS. **12**A-B illustrate a components plan of an exemplary standard studio unit for various walls and components before and after assembly.

FIGS. **13**A-F illustrate a perspective view of different phases of assembling an exemplary standard studio unit.

FIGS. **14**A-B illustrate a components plan of an exemplary one bedroom unit for various walls and components before and after assembly.

FIGS. **15**A-F illustrate a perspective view of different phases of assembling an exemplary one bedroom unit.

FIGS. **16**A-B illustrate a components plan of an exemplary two bedroom unit for various walls and components before and after assembly.

FIGS. **17**A-F illustrate a perspective view of different phases of assembling an exemplary two bedroom unit.

FIGS. **18**A-D illustrate side and top views of the exterior window wall assemblies for various units.

FIGS. **19**A-C illustrate sectional base and head details of structural members before attaching the demising wall to the slab.

FIGS. **20**A-C illustrate sectional details of steps to secure the demising wall base to the slab.

FIGS. **21**A-C illustrate sectional details of steps to secure the demising wall head to the slab.

FIG. **22** illustrates cross sectional head and base details of the demising wall attached to the slab.

FIG. **23** illustrates sectional details for attaching the exterior or end wall to the slab.

FIGS. **24**A-C illustrate sectional head details of structural members before attaching the utility wall to the slab.

FIGS. **25**A-C illustrate sectional base details of structural members before attaching the utility wall to the slab.

FIG. **26** illustrates sectional details for attaching the utility wall to the slab.

FIGS. **27**A-B illustrate plan details of the end wall and demising wall interfacing with the exterior window wall after attaching the exterior window wall to the slab.

FIGS. **28**A-B illustrate sectional details for attaching the exterior window wall to the slab.

FIGS. **29**A-D illustrate a side view of an entry way and attachment to the floor slab.

FIG. **30** illustrates a top view of an entry way with utility wall and demising wall installed.

FIGS. **31**A-B illustrate a detailed view of an entry way interfacing with the end wall and demising wall with an adjacent entry door.

FIGS. **32**A-B illustrate an elevation view of the utility wall without bath and kitchen components in place as well as the utility wall with bath and kitchen components in place.

FIGS. **33**A-B illustrate top and side views of a bathroom.

FIGS. **34**A-B illustrate various shower pan and drain options.

FIGS. **35**A-C illustrate cross-sectional details of the interior glass partitions and bathroom doors before and after attachment to the slab.

FIGS. **36**A-B illustrate cross-sectional details of the bedroom glass partition before and after attachment to the slab.

FIGS. **37**A-C illustrate cross-sectional details of the bedroom entertainment wall before and after attachment to the slab.

FIGS. **38**A-B illustrate cross-sectional details of installing a parapet wall component over a roof.

FIGS. **39**A-B illustrate cross-sectional details of installing a garden roof drain next to the parapet wall component.

FIG. **40** illustrates cross-sectional details of constructing exterior common walkways.

FIG. **41** illustrates in a cut away view the components that make up the completed utility wall.

FIG. **42** illustrates the component parts of the utility wall, including the supply and waste piping and vent ducting to pre-designated locations, and installation of the water heater within the wall cavity.

DETAILED DESCRIPTION OF THE INVENTION

Before describing the invention and the figures, some of the terminology should be clarified. Please note that the terms and phrases may have additional definitions and/or examples throughout the specification. Where otherwise not specifically defined, words, phrases, and acronyms are given their ordinary meaning in the art. Exemplary embodiments may be better understood with reference to the drawings, but these embodiments are not intended to be of a limiting nature.

As used herein, "prefinished" refers to a component or components that arrive at the building site partially or fully completed and ready to be installed, and may include application of both the interior and exterior finish materials to the component(s).

As used herein, "pre-bundled" refers to a pre-manufactured component or components that are partially or fully protected, packaged, secured or otherwise made ready for transportation to the building site.

As used herein, "preassembled" refers to the partial or full assembly of a pre-manufactured component or components that occurs wholly or in part at a location other than the building site.

The exterior window wall may be an aluminum and glass panel with the possibility of containing an operable window unit. The exterior window wall may include the use of spandrel or fritted glass, as well as metal panel within the frames. The exterior window wall may also include an integral sliding door and railing to create an open wall with a flush 'Juliet' balcony or a full balcony bolted onto the structural frame. A first type of exterior window wall may be used in a straight configuration. A second type of exterior window wall may be used in corner units located adjacent to a building's corners. All of the exterior window walls may be fully weather-sealed and may be able to provide a U-factor of at least about 0.40. A U-factor measures the rate of heat transfer through a building element over a given area.

The entry doors may be a pre-fabricated, pre-bundled entry door unit with operable transom panel above, inner and outer frames, and all associated door hardware with preassembled sections that may include electrical wiring and may include plumbing for sprinklers. The entry door may be set in place at the final exterior wall or adjacent to the utility walls. A threshold may be provided for installation after the entry door is in place.

The kitchen unit may be a pre-fabricated and preassembled kitchen unit and may include cabinets, preinstalled plumbing, plumbing connections, electrical wiring, vent ducting, countertops, at least one sink, exhaust vents/fans and light fixtures that may be installed on, or connected to, the kitchen on the utility walls.

The cabinets may be pre-manufactured and preassembled cabinets that may include integral exhaust fans, light fixtures, refrigerator and/or washer and dryer to be installed on, or connected to, the utility walls.

The bathroom vanity may include at least one sink and preinstalled plumbing that may be installed on, or connected to, the bathroom on the utility walls.

The parapet wall may be a pre-manufactured, prefinished, and preassembled wall at the top portion of the exterior window wall, end wall, exterior wall, or utility wall that may connect to a roof slab and accommodate a building's roofing and/or garden roof conditions.

The exterior walkway may be a pre-fabricated, pre-bundled walkway with preassembled sections that may support railing and decking for rapid installation. The exterior walkway may be used in place of scaffolding during construction. Specifically, the exterior walkway may be used to provide access to secure slabs to the structural columns and/or beams and to provide ease of access for connecting utilities.

It should be noted that although these embodiments are described in relative terms as prefinished, preassembled and/or pre-bundled, the present invention is not limited to pre-manufactured building structures that are completely prefinished, preassembled and/or pre-bundled in the factory or at a site other than the building site. The present invention also encompasses the final finishing or assembly of the pre-manufactured structures and/or the use of non-pre-bundled components at the building site. The use of partially prefinished, preassembled and/or pre-bundled pre-manufactured structures may be determined on a project by project basis.

Referring now in detail to the drawing figures, FIG. **1** illustrates an exemplary embodiment of a building **100** built according to the construction system and method of the present invention. FIG. **1** illustrates an exemplary six-story building **100** that is part of a development including several residential buildings **101** and **102** with a plaza or retail floor **110** at street level for commercial activity and secure, below-grade parking underneath the building **100**. All of the residential buildings **101** and **102** in this development are to be constructed using the same construction system and method of the present invention.

FIGS. **2**A-B illustrate a building plan **200** of the exemplary building **100** of FIG. **1**. As shown in FIG. **2**A, all of the buildings share common exterior walkways. The inventors also note that the present invention may be readily adapted to include courtyards which may provide shared community or amenity space. By enclosing these exterior spaces within courtyards, building residents may enjoy the outdoor shared space and may also enjoy improved security if these spaces are closed off from access external to the building. FIG. **2**B illustrates a detailed plan view of exemplary building plan **200** of FIG. **2**A with four variations of floor plans **200**A-D. Floor plans **200**A-D are provided as examples only, and are not limiting with regard to the present invention.

FIG. **3** illustrates a side elevation view of an exemplary six-story building. This exemplary building comprises sec-

ond through sixth levels of residential units **210**, **220**, **230**, **240**, **250** above a main, retail floor **110** for commercial development at the street level and a level of below-grade parking (shown in FIG. **4**).

FIG. **4** illustrates a side sectional view of an exemplary portion of the multi-story building of FIG. **3**. As shown in FIGS. **3** and **4**, the retail floor **110** for commercial activity is shown with residential levels **210**, **220**, **230**, **240**, **250** above the retail floor **110**. Every residential level from second through sixth **210**, **220**, **230**, **240**, **250** may be identical in building floor plan and configuration. The present invention may comprise, but is not limited to, identical building floor plans and configurations for every floor. The present invention allows the number of bedrooms in any given residential unit and the layout of the units on any given floor to be modified by the simple relocation of a demising wall. However, with the present invention, the location of the utility wall should remain vertically stacked in order to maintain many of the efficiencies that are currently realized by this invention. These modifications to the layout of the units or number of bedrooms also do not require changing out of the window wall components. Furthermore, depending on the specific circumstances, there may be additional modifications to the exterior walls to accommodate different floor plans and layout of the units for various floor levels. A below grade parking level **206** is shown for parking cars for commercial and/or residential use.

FIGS. **5**A-B illustrate a floor plan **200**A from FIG. **2**B of the building plan **200**. The floor plan **200**A of the building plan **200** illustrates many different layout types of units **200**A-**1** to **200**A-**8**.

FIGS. **6**A-B illustrate exemplary floor plans **300**A-H and **300**J of the different types of units and layout variations to be implemented into any floor level **210**, **220**, **230**, **240**, **250** of a multi-story building **100**. An efficiency plan **300**A is illustrated in the first exemplary unit type. A studio plan **300**B is illustrated in the second exemplary unit type. A one-bedroom plan **300**C, as possible corner units, is illustrated in the third exemplary unit type. A two-bedroom efficiency plan **300**D, as possible units, is illustrated in the fourth exemplary unit type. A two-bedroom plan **300**E, as possible end units, is illustrated in the fifth exemplary unit type. In **300**F, a two-bedroom with two bathrooms is illustrated in the sixth exemplary unit type. A three-bedroom with three beds and two bathrooms **300**G, as possible end units, is illustrated in the seventh exemplary unit type. A two-bedroom with two bathrooms plan **300**H on a corner is illustrated in the eighth exemplary unit type. A three-bedroom with two bathrooms plan **300**J on a corner is illustrated in the ninth exemplary unit type. It should be noted that this figure is not meant to limit the types and arrangements of possible unit layouts in the present invention.

The lift-slab construction of the multi-story building **100** is described in detail for the load bearing assembly of the structural frame **400** and floor slabs **450**. More specifically, FIG. **7** illustrates the structural frame **400** of the exemplary multi-story building **100** of FIG. **1**. The structural frame **400** material is preferably steel even though other materials with similar strength and durability may be used for constructing the building **100**. Therefore, utilizing steel for the structural frame **400** is not meant to be limiting. The structural frame **400** can also be made out of cast-in-place concrete, concrete masonry unit, precast concrete or similar materials. Vertical columns **405**, horizontal beams **406**, and diagonal brace frame members **407** are used for this load bearing assembly of the structural frame **400**. Structural steel framing occurs only at the perimeter of the building's slabs. All primary steel framing members are positioned exterior to the building for providing support. The steel framing **400** is delivered to the site in as-complete-of-an-assembly as possible, only limited in size by shipping or trucking restrictions. Vertical columns **405**, horizontal beams **406** and diagonal brace frames **407** may be hoisted by crane and braced and bolted into place. The perimeter steel framing **400** for the building **100** may be placed prior to or after the building's slabs **450**A-F are poured in place (shown in FIG. **8**). Strand jacks are strategically located atop the support columns and/or beams. The number of strand jacks used is dependent on the length and shape of the floor slabs to be hoisted. Cables are lowered to reach the first slab and securely attached to the slab at predetermined attachment locations. The slab is then hoisted to the upper most level and secured to the steel framing **400**.

For preconstruction and excavation prior to building the structural frame **400**, conventional methods of surveying, excavation and shoring may be utilized that are appropriate for the existing soil/ground conditions and preferred depth required for excavation. For example, deeper excavations may require shoring and possible below-grade waterproofing. Shoring may be constructed using concrete or wood, or other suitable material, depending on the best option for the area. Locating, trenching and extending the existing utilities to the new structure may utilize conventional methods of construction and may occur in conjunction with excavation and construction of the foundation.

For foundation construction, including basements if applicable, footings are first applied, spread and matted evenly. Any forming, reinforcing, and casting of footings and foundation walls may utilize conventional methods of concrete construction. For basements, formwork and reinforcing of below-grade walls may utilize conventional slip-form concrete construction. Slip-form construction refers to a method by which large towers or bridges are built from concrete by pouring concrete into a form and moving the hardened concrete. Typically, slip-form construction minimizes the materials used in formwork and labor, reduces the amount of concrete waste produced, and also allows for the foundation walls to be erected with the rapid speed. Unlike other concrete methods, slip-form construction does not produce over-shot concrete structures and requires very little cleanup or hauling away of waste concrete product. All site utilities may be extended to the building's service points while staged and protected for future connections. Similarly for elevator and stair foundation, excavation and forming of the foundation for the elevator and stair systems may be carried out in conjunction with the rest of the building's excavation and forming. Formwork may be properly placed, reinforcement added, and the foundation concrete may be placed and finished.

For concrete slab-on-grade construction, conventional construction practices may be utilized. A slab-on-grade may occur either at the basement level or at grade level if no basement is built. Utilities may be extended so that they are about 6 to 8 feet above the top of the slab either at the basement level or at grade level. Once this step is finished, the steps of placing the backfill, providing compaction, installing gravel, positioning vapor barrier, if required for local geotechnical review, and securing the slab reinforcement may be followed by placing and finishing the concrete slab. If a particular design incorporates below grade parking, the step of constructing a ramp may be implemented. Alternatively, the step of constructing a ramp may occur after the slab-on-grade is positioned into place. Typically, the ramp's formwork may be placed and followed by the

step of securing and installing of the slab reinforcement. After these steps, the ramp's concrete slab may be placed and finished.

Assuming that only one level of parking is constructed below grade, the steps of positioning the shoring and forming the slab-on-grade level may be carried out after the basement slab and ramp are placed. Afterwards, the steps of securing slab reinforcement, any block-outs or sleeves required for the building's mechanical, plumbing, electrical, communications, site planter drainage, irrigation, parking control systems and electrical connections for security and lighting may be implemented. The steps of pouring, finishing and sealing concrete may then be implemented. If a commercial or retail level is being considered for the at grade level, then the concrete slab at the second story may be placed by conventional shoring and forming methods.

For constructing a plaza **110** for retail at the street level with an exterior courtyard, a residential terrace may be constructed at the level immediately above the retail level as shown in FIGS. **1**, **3** and **4**. Conventional methods, including cast-in-place concrete construction, may be used for all construction up to and including the terrace level slab. Cast-in-place concrete construction may be used for foundations, slabs-on-grade, structural support such as walls, beams, columns, floors, roofs, large portions of bridges, pavements, and other infrastructures by transporting concrete in its unhardened state to the site for placement in forms. The step of placing slab reinforcement, any block-outs or sleeves required for the building's mechanical, plumbing, and electrical and communications systems as well as any walkway drains, and electrical connections for security and lighting may be implemented. Once reinforcement and block-outs are placed, concrete may be poured, finished and sealed. Columns for the plaza at the street/retail level **110** may utilize cast-in-place concrete construction. The reinforcement for the columns is placed first. Thereafter, the column formwork is placed before pouring the concrete for forming the columns. These steps may be carried out prior to erecting any shoring for the terrace slab **205** as shown in FIG. **4**. Shoring may then be placed to support any decking made of wood or other similar materials and other formwork for the terrace slab **205** at the second story level above the plaza/retail level **110**. This step may be followed by the step of placing the slab reinforcement, any block-outs or sleeves required for the building's mechanical, plumbing, electrical and communications systems as well as for any courtyard drains, irrigation supply lines and electrical connections for security and lighting. Once the reinforcement and block-outs are placed, the terrace slab **205** of concrete may be poured, finished and sealed.

FIGS. **8-9** illustrate the steps of forming the floor and roof slabs **450**A-F and placing the floor slabs and roof slab **450**A-F at each level by lifting up the slabs **450**A-F and securing the slabs **450**A-F at their appropriate elevation level. The floor slabs and roof slab **450**A-F above the plaza/retail level **110** utilize a method of construction wherein slab formwork may be reused. Determining whether the slabs are poured one-on-top-of-the-other and hoisted to their appropriate elevation or the roof slab is placed first and then the formwork is lowered after the placement of each slab, depends on a general contractor's decision based on the local conditions and logistics of each site. The preferred method is pouring the slabs **450**A-F one-on-top-of-the-other which are then hoisted to their appropriate elevation level. In the preferred method, a bond breaking solution is applied to the surface of the lower slab between each pour of the successive slab to ensure adequate separation between the slabs **450**A-F.

As noted earlier, the forming and pouring of the floor slabs and roof slab **450**A-F may occur prior to or after the building's structural frame **400** is erected. If using the plaza/retail level **110** slab as a base, the building's typical floor slabs and the roof slab **450**A-F are poured one on-top-of the other, using the slab **450**A below as the formwork for the slab **450**B above. All of the slabs **450**A-F will remain stacked on the plaza/retail level **110** surface until the slabs **450**A-F have cured and reached the desired design strength. Upon curing, the slabs **450**A-F are ready to be hoisted or lifted up to their finished elevation via a series of strand jacks strategically located atop the support columns and/or beams. The number of strand jacks used is dependent on the length and shape of the floor slabs to be hoisted. Upon the forming, pouring and curing of all of the slabs **450**A-F, each of the floor slabs and roof slab **450**A-F will then be loaded with a plurality of non-weight bearing walls, a plurality of exterior window walls, a plurality of interior components, and a plurality of exterior components, followed by lifting or hoisting up to the appropriate elevation level so that every slab **450**A-F is securely positioned and attached at every building level so that non-weight bearing walls, exterior window walls, interior components, and exterior components may be installed at every level in-between floor slabs and roof slab **450**A-F. Each hoisted floor slab contains numerous concrete embedded steel plates that will align with steel plates securely attached to the structural beams and/or columns **405**, **406** as the slabs are hoisted into position. Upon reaching the appropriate position and the plates become aligned, a bolted or pinned connection may be used to securely attach the slabs **450**A-F to the structural frame **400**. The exterior walkways, exterior beams **410**A-F and/or the use of man lifts may be used as a means of accessing the connections points, thereby eliminating any unnecessary hazards of having workers located under the unsecured slabs to access the connection points.

An alternate method may include installing exterior roof components on the cured top or roof slab **450**F and lifting the top or roof slab **450**F all the way to the top of the building via a series of strand jacks strategically located atop the support columns and/or beams. The number of strand jacks used is dependent on the length and shape of the floor slabs to be hoisted. Immediately after securing the top slab **450**F, a plurality of non-weight bearing walls, exterior window walls, and some of the interior components, including the shower pan, kitchen and bathroom components are installed on a second slab **450**E beneath the first slab **450**F that is not yet lifted. Upon installation of the non-weight bearing walls and some of the interior components, and upon loading of the exterior window walls and rest of the interior components on the second slab **450**E below, the second slab **450**E with non-weight bearing walls, exterior window walls, and interior components, is lifted or hoisted up under the first slab at the top **450**F and securely attached to the load bearing structural frame **400** to make the top floor or level. Each hoisted floor slab contains numerous concrete embedded steel plates that will align with steel plates securely attached to the structural beams and/or columns **405**, **406** as the slabs are hoisted into position. Upon reaching the appropriate position and the plates become aligned, a bolted or pinned connection may be used to securely attach the slabs **450**A-F to the structural frame **400**. The exterior walkways, exterior beams **410**A-F and/or the use of man lifts may be used as a means of accessing the connections

points, thereby eliminating any unnecessary hazards of having workers located under the unsecured slabs to access the connection points.

The next sequence of steps involves installation of elevators and stairs. The pre-fabricated, pre-bundled stairs with preassembled sections is delivered to the site. Lower sections of the stairs are set and anchored into place simultaneously with the placement of the street level slab or at grade slab **430**. Installation of the stairs will track closely with the installation of the building's structural frame **400**. Installation of the structural framing for the elevator enclosure will track in conjunction with installation of the rest of the building's vertical columns **405**.

Upon securely attaching the second slab **450**E to the load bearing structural columns and beams **405**, **410**E, the loaded exterior window walls and the rest of the interior components including the entry doors and interior partitions are installed to the second slab **450**E to complete the building's top level. Non-weight bearing walls, the exterior window walls, kitchen and bathroom components are next installed on a third floor slab **450**D beneath second slab **450**E. Similar to the previously described process for constructing the top level, the exterior window walls and the rest of the interior components are loaded on the third slab **450**D below, and the third slab **450**D with the non-weight bearing walls and the interior components, whether installed or loaded, is lifted up or hoisted under the second slab **450**E and securely attached to the load-bearing structural columns and beams **405**, **410**E to make a level beneath the top level. This process of loading and installing the non-weight bearing walls, the exterior windows, and the interior components is repeated until all the building levels are completed.

Upon suspending the slabs **450**A-F at their appropriate elevation levels, each slab **450**A-F is bolted or pinned to the vertical columns **405** and horizontal beams **410**A-F which make up the load bearing steel framing **400**. For example, the roof slab **450**F is securely attached to the vertical columns **405** and the top horizontal beam **410**F. The top floor slab **450**E is securely attached to the vertical column **405** and the fifth horizontal beam **410**E. The fourth floor slab **450**D is securely attached to the vertical columns **405** at the fourth horizontal beam **410**D. The third floor slab **450**C is securely attached to the vertical columns **405** at the third support beam **410**C. The second floor slab **450**B is securely attached to the vertical columns **405** at the second support beam **410**B. The first floor slab **450**A is securely attached to the vertical columns **405** at the first support beam **410**A. The present invention limits or eliminates the time consuming and costly process of field welding, however the use of field welding is not prohibited in the present invention.

Conventional steel reinforcing bars and post tensioned cables may be used in the slabs **450**A-F. The span of the slab **450**A-F is set at a distance that can be supported within the depth and width of the slab **450**A-F. Upon placing the slabs **450**A-F at appropriate elevation levels, they will fully support their spans without the use of supplemental beams or columns. Electric radiant heat coils may be incorporated into the concrete floor slabs **450**A-F to heat each unit. The structural floor slabs **450**A-F may act as the finished floor slab for the unit above or the finished ceiling for the unit below. Acoustical and impact isolation at the slab **450**A-F is required and may either be accomplished by coverage on the floor and/or by including optional pre-fabricated ceiling panels which may also include acoustical paneling.

FIGS. **10**A-B illustrate a components plan of an exemplary efficiency studio unit **300**A from FIG. **6**A for various walls and components before and after assembly. As shown in FIGS. **10**A-B of the exemplary efficiency studio unit **300**A, the efficiency studio unit **300**A is enclosed by the exterior window walls **530**B, exterior window wall panels **530**D, demising walls **500**A-B, and utility wall **520**. The efficiency studio unit **300**A further includes interior components kitchen unit **600**A, bathroom vanity **610**, toilet **611**, shower pan **612**A and shower partitions **620**A-B. The exterior window wall panels **530**D are part of the exterior window wall system and positioned in-between the exterior window walls of each unit. On the opposing side of the exterior window walls **530**D in a parallel direction, the utility wall **520** is installed for connecting the bathroom and kitchen components. The entry door **540** is positioned between the utility walls **520** and demising wall **500**B for easy entry into the efficiency studio unit **300**A.

Each of the demising walls **500**A-B are positioned directly opposite of each other in a parallel direction to enclose the studio unit **300**A. The shower **612**A (later shown in FIGS. **33**A-B) is partitioned off by the first and second shower partitions **620**A-B. The bathroom is partitioned off by the sliding bathroom door **621** attached to the second shower partition **620**B and kitchen unit **600**A. The kitchen unit **600**A is installed in a perpendicular direction against the utility wall **520** and has a kitchen sink **601**, cooktop **602**A, and cabinets (not shown in FIG. **10**). Other internal furniture such as a bed, desks, chairs, dresser, coffee table, and couches may be placed anywhere.

FIGS. **11**A-F illustrate a perspective view of different phases of assembling an exemplary efficiency studio unit and its interior components. FIG. **11**A illustrates an exemplary efficiency studio unit floor **460** of the slab with a recess **470** for a possible recessed shower pan. After the slabs **460** are in place, the demising walls **500**A-B are delivered to the site. Each of the demising walls **500**A-B can be installed in place in the studio unit. In this particular embodiment, the demising walls **500**A-B are single components. However, depending on the overall plan, the dimensions of the demising walls **500**A-B are easily changeable and not limited to these dimensions. The demising walls **500**A-B shown in FIG. **11**B are delivered to the site as preassembled, prewired and prefinished components. The demising walls **500**A-B and all other components can either be installed after the slabs are hoisted or installed in their final position prior to the slabs **460** being lifted.

As shown in FIG. **11**C, a utility wall **520** is installed so that a bathroom vanity **610** (not shown) and toilet **611** (not shown) can be installed against the utility wall **520**. As shown in FIG. **11**D, window walls **530**B, **530**D are installed to further enclose the studio unit. In the next step as shown in FIG. **11**E, the entry door **540** may be installed either after or before installation of the bathroom and kitchen components. The shower pan **612**A is fitted into the slab recess **470**, if a recess is provided, before installing the bathroom and kitchen components. As shown in FIG. **11**F, immediately adjacent to the bathroom is a kitchen unit **600**A with a kitchen sink **601** and a countertop, cooktop **602**A, and cabinets **603**. The shower partition **620**A-B separates the shower and bathroom from the living space area with a sliding door **621**. An upper glass partition **641** is installed above the kitchen unit **600**A to further separate the bathroom from the kitchen area. The details of attachment of the demising walls **500**A-B, window walls **530**B, **530**D, utility wall **520**, entry door **540**, and interior components of the exemplary efficiency studio unit to the slab **460** are described further in detail in FIGS. **19-37**.

FIGS. **12**A-B illustrate a components plan of an exemplary standard studio unit **300**B from FIG. **6**A for various

walls and components before and after assembly. As shown in FIGS. **12**A-B of the exemplary standard studio unit **300**B, the standard studio unit **300**B is enclosed by the exterior window walls **530**C, exterior window wall panels **530**D, demising walls **500**A-B, and utility wall **520**. The standard studio unit **300**B further includes interior components kitchen unit **600**B, bathroom vanity **610**, toilet **611**, shower pan **612**A and shower partitions **620**A-B. The exterior window wall panels **530**D are part of the exterior window wall system and positioned in-between the exterior window walls of each unit. On the opposing side of the exterior window walls **530**C in a parallel direction, the utility wall **520** is installed for connecting the bathroom and kitchen components. The entry door **540** is positioned between the utility wall **520** and demising wall **500**B for easy entry into the efficiency studio unit **300**B.

Each of the demising walls **500**A-B are positioned directly opposite of each other in a parallel direction to enclose the studio unit **300**B. The shower **612**A (later shown in FIGS. **33**A-B) is partitioned off by the first and second shower partitions **620**A-B. The bathroom is partitioned off by the sliding bathroom door **621** attached to the second shower partition **620**B and the storage cabinet **630**A. The kitchen unit **600**B is installed against the utility wall **520** that has a kitchen sink **601**, cooktop **602**A, and cabinets (not shown in FIG. **12**). Other internal furniture such as a bed, desks, chairs, dresser, coffee table, and couches may be placed anywhere.

FIGS. **13**A-F illustrate a perspective view of different phases of assembling an exemplary standard studio unit and its interior components. FIG. **13**A illustrates an exemplary standard studio unit floor **461** of the slab with a recess **470** for a possible recessed shower pan. After the slabs **461** are in place, the demising walls **500**A-B are delivered to the site. Each of the demising walls **500**A-B can be installed in place in the studio unit. In this particular embodiment, the demising walls **500**A-B are single components. However, depending on the overall plan, the dimensions of the demising walls **500**A-B are easily changeable and not limited to these dimensions. As shown in FIG. **13**B, the demising walls **500**A-B are delivered to the site as a preassembled, pre-wired and prefinished components. The demising walls **500**A-B and all other components can either be installed after the slabs are hoisted or installed in their final position prior to the slabs **461** being lifted.

As shown in FIG. **13**C, a utility wall **520** is installed so that a bathroom vanity **610** (not shown) and toilet **611** (not shown) can be installed against the utility wall **520**. As shown in FIG. **13**D, window walls **530**C, **530**D are installed to further enclose the studio unit. In the next step as shown in FIG. **13**E, the entry door **540** may be installed either after or before installation of the bathroom and kitchen components. The shower pan **612**A is fitted into the slab recess **470**, if a recess is provided, before installing the bathroom and kitchen components. As shown in FIG. **13**F, immediately adjacent to the bathroom is a kitchen unit **600**B with a kitchen sink **601** and a countertop, cooktop **602**A, and cabinets **603**. The shower partition **620**A-B separates the shower and bathroom from the living space area with a sliding door **621**. An upper glass partition **641** is installed above the storage cabinet **630**A to further separate the bathroom from the kitchen area. The details of attachment of the demising walls **500**A-B, window walls **530**C, **530**D, utility wall **520**, entry door **540**, and interior components of the exemplary standard studio unit to the slab **461** are described further in detail in FIGS. **19-37**.

FIGS. **14**A-B illustrate a components plan of an exemplary one bedroom unit **300**C from FIG. **6**A for various walls and components before and after assembly. As shown in FIGS. **14**A-B of the exemplary one bedroom unit **300**C, the one bedroom unit **300**C is enclosed by the exterior window walls **530**A-B, exterior window wall panels **530**D, demising walls **500**A-B, and utility wall **520**. The one bedroom unit **300**C further includes interior components kitchen unit **600**C, bathroom vanity **610**, toilet **611**, shower pan **612**B, shower partitions **620**A-B, and a sliding bedroom glass partition **640** that separates the bedroom from the living room. The exterior window wall panels **530**D are part of the exterior window wall system and positioned in-between the exterior window walls of each unit or room. On the opposing side of the exterior window walls **530**A-B in a parallel direction, the utility wall **520** is installed for connecting the bathroom and kitchen components. The entry door **540** is positioned between the utility wall **520** and demising wall **500**B for easy entry into the one bedroom unit **300**C.

Each of the demising walls **500**A-B are positioned directly opposite of each other in a parallel direction to enclose the one bedroom unit **300**C. The shower **612**B (later shown in FIGS. **33**A-B) is partitioned off by the first and second shower partitions **620**A-B. The bathroom is partitioned off by the sliding bathroom door **621** attached to the second shower partition **620**B and the storage cabinet **630**B. The kitchen unit **600**C is installed against the utility wall **520** that has a kitchen sink **601**, cooktop **602**B, and cabinets (not shown in FIG. **14**). Other internal furniture such as a bed, desks, chairs, dresser, coffee table, and couches may be placed anywhere.

FIGS. **15**A-F illustrate a perspective view of different phases of assembling an exemplary one bedroom unit and its interior components. Similar to assembling the standard studio unit as shown in FIGS. **13**A-F, the demising walls **500**A-B are delivered to the site as preassembled, pre-wired and prefinished components and installed prior to installation of the exterior window walls **530**A-B. The utility wall **520** is similarly installed next to continue to enclose the one bedroom unit. All the internal bathroom and kitchen components are similarly installed as described in FIGS. **13**A-F. The window walls **530**A-B are then tilted into place to partially enclose the one bedroom unit **300**C. As illustrated in FIG. **15**F, the bedroom is separated from the living area by a sliding bedroom glass partition **640** which terminates at a storage cabinet **630**B and window wall panel **530**D. The bathroom has a sliding bathroom door **621** that is attached to the shower partition **620**B that also separates the bathroom. An upper glass partition **641** is installed above the storage cabinet **630**B to further separate the bathroom from the kitchen area. The details of attachment of the demising walls **500**A-B, window walls **530**A-B, **530**D, utility wall **520**, entry door **540**, and interior components of the exemplary one bedroom unit to the slab are described further in detail in FIGS. **19-37**. On the side of the utility wall **520**, an entry door **540** is installed to fully enclose the one bedroom unit.

FIGS. **16**A-B illustrate a components plan of an exemplary two bedroom unit **300**F from FIG. **6**B for various walls and components before and after assembly. As shown in FIGS. **16**A-B of the exemplary two bedroom unit **300**F, the two bedroom unit **300**F is enclosed by the exterior window walls **530**A-B, exterior window wall panels **530**D, demising walls **500**A, and utility walls **520**. The two bedroom unit **300**F further includes interior components kitchen unit **600**C with sink **601** and a countertop, cooktop **602**B, bathroom vanity **610**, toilet **611**, shower pan **612**B shower partitions **620**A-B, sliding bedroom glass partition **640** that separates

the first bedroom from the living room. Furthermore, two bedroom unit **300**F includes entertainment wall **642** and glass pocket doors **643** that separates the second bedroom from the living room, and storage cabinets **630**B-C. The exterior window wall panels **530**D are part of the exterior window wall system and positioned in-between the exterior window walls **530**A-B. On the opposing side of the exterior window walls **530**A-B in a parallel direction, the utility walls **520** are installed for connecting the bathroom and kitchen components. The entry door **540** is positioned between the utility walls **520** for easy entry into the two bedroom unit **300**F.

Alternatively, the exemplary two bedroom unit can be configured in a number of various ways. Any of the layouts are flexible and walls as well as components can be changed around. For example, the entry door **540** can be positioned adjacent to storage cabinet **630**B and kitchen unit **600**C moved adjacent to storage cabinet **630**C; storage cabinets **630**B-C can be interchanged; sliding bedroom door **640** and entertainment wall **642** are completely interchangeable with each other.

FIGS. **17**A-F illustrate a perspective view of different phases of assembling an exemplary two bedroom unit. The process for assembling exemplary two bedroom unit **300**F shown in FIG. **6**B is similar in nature to assembling exemplary one bedroom unit **300**C shown in FIG. **6**A as described above in FIGS. **15**A-F. In addition, exemplary two bedroom unit **300**F contains an additional storage cabinet **630**C, entertainment wall **642** with glass pocket doors **643**, and could contain an additional bathroom and all of its components. Sequence and installation of these additional components for exemplary two bedroom unit **300**F are constructed along the same timeline as the similar components as exemplary one bedroom unit **300**C.

FIGS. **18**A-D illustrate side and top views of various configurations of the exterior window walls **530**A-D for various units. The exterior window walls have operable windows **531**A-B for easily opening the windows for outside access. The operable windows open by swinging, sliding or by any other mechanisms used to open windows. The quantity, location, and spacing of the operable windows can vary from unit to unit and from building to building. The exterior window walls **530**A-D may contain clear glass, spandrel glazing with backup insulation or metal panel with backup insulation. Any of these exterior window walls **530**A-D may be installed to accommodate different layouts of units. All of the exterior window walls **530**A-D are delivered to the site pre-glazed for rapid installation.

In an effort to keep the construction as efficient as possible for on-site staging, storage of materials, walls and components are minimal. All of the building's fundamental elements are delivered to the site as pre-fabricated and prefinished components. These pre-fabricated and prefinished components include all exterior walls, demising walls, interior partitions, all kitchen and bathroom units, and other components. Walls are typically delivered in a minimum of ten foot lengths and may be as large as 20 foot lengths or more unless noted otherwise, and may be hoisted directly from the truck or other transport means to their final location for immediate installation.

The floor slabs and roof slab **450**A-F are either lifted and secured to the load bearing structural frame **400** or the floor slabs and roof slab **450**A-F are loaded, lifted and secured to the load bearing structural frame **400**. The step of constructing a building for the present invention may involve placing or installing the demising walls **500**A-B as shown in FIGS. **19-22** in their final position either prior to or after the slabs are lifted and secured in place. The exemplary demising wall **500**A has a head track **700**A and a base track **700**B as shown in FIGS. **19**A-C. The demising wall **500**A is composed of staggered metal stud framing **701** with acoustical blanket insulation layer **702**, electrical connections, sprinklers, and communications components. The acoustical insulation layer **702** is preferably about 2" to 3" thick, weaved through the studs and contributes to a sound transmission class (STC) rating for the entire assembly of about 50 or higher. The electrical wiring is pre-installed at the factory and connected at the site while installing the demising walls **500**A to the other components. Both sides of the demising wall **500**A receive a layer of fire-rated wall sheathing **703**. The preferred method for finishing the demising wall **500**A is to attach a finish panel **704** over both sides of the demising wall **500**A at the site using wood or metal cleats **705** installed on the wall sheathing **703**. Several options are available for the exemplary finish panel **704**, including but not limited to, stain, paint, magnesium-oxide board, wood veneer, wood paneling, plaster, metal, wallpaper, and cork. A preferred application for the sheathing material **703** is a 12 mm magnesium oxide board, however, other similar fire-rated panels or materials may be used. Alternately, the finish panel **704** and cleats **705** may be omitted and the wall sheathing finished in a more conventional manner. More specifically, the wall sheathing may be taped and painted so as long as it achieves the required fire rating per local building codes.

The first step of installing the demising wall **500**A utilizes prefinished, acoustically sealed L-shaped support members **706**A-B and fasteners **707** which are secured to the top and undersides of the floor slab **450**. As shown in FIGS. **20**A and **21**A, the horizontal section of the L-shaped base and head support member **706**A-B has a pre-drilled hole (not shown) to receive the fastener **707** for securely attaching the L-shaped support member **706**A-B to the slab **450**. Therefore, the support members **706**A-B are securely attached to the top portion and underside of the slab **450** by drilling the base fastener **707** through the hole, the neoprene pad **708** at the base and into the slab **450**. The pad **708** is positioned immediately beneath the horizontal section of the base support member **706**A. Adjacent to the pad **708**, fire-sealant tape **709** is placed on each side of the pad **708** before drilling the base fastener **707** into the slab **450**.

As shown in FIGS. **20**B and **21**B, upon securely attaching the support members **706**A-B to the top and undersides of the slab **450**, the entire demising wall **500**A is set onto the base support member **706**A and secured into place. Simultaneously, the head section of the demising wall **500**A is placed adjacent to and inside the L-shaped head support member **706**B and securely positioned into place. The next step is to insert a support fastener **707** horizontally from the vertical side of the base and head support member **706**A-B through the demising wall **500**A as shown in FIGS. **20**B and **21**B. The head support member **706**B has pre-drilled holes (not shown) to allow vertical movement from slab **450** after support fastener **707** has been attached between the vertical side of the base and head support member **706**A-B. The next step as illustrated in FIG. **20**C is to cover the inner side of the demising wall **500**A by attaching the base trim **710**A, preferably made of metal or other similar materials. More specifically, the base trim **710**A is preferably made of similar material as the L-shaped base support member **706**A. Base trim **710**A is attached with fastener **707**.

As shown in FIG. **21**C, the next step in securing the demising wall is filling the horizontal gap created between the underside of the slab **450** and the head portion of the

demising wall **500**A with fire-safe materials **711**. After installing the fire-safe material **711**, the next step is sealing any open spaces between the slab **450** and the head portion of the demising wall **500**A with caulk, preferably fire-resistant caulk, to prevent any fire from getting through the space. Caulk or similar fire-resistant material is also used to seal the space between the horizontal portion of the head support member **700**A and the underside of the floor slab **450** whereby the fire-safe materials **711**, backer rod and sealant **715** are inserted. This horizontal gap whereby the fire-safe materials **711** are filled also allows vertical movement of the slab **450** due to deflection. Upon sealing the open spaces between the demising walls **500**A and the slab **450**, the head trim **710**B is attached, preferably made of metal or other similar materials. More specifically, the head trim **710**B is preferably made of similar material as the L-shaped head support member **706**B. Head trim **710**B is attached on the inner side of the demising wall **500**A with fastener **707**. FIG. **22** illustrates a completely installed demising wall **500**A to floor slab **450**.

The next step of constructing a building using the present invention may be installing end walls **510**, particularly when a unit is not located in the middle of a building. A living unit that is located in the middle of a building is enclosed between two demising walls **500**A-B that are parallel to one another. In this case, both demising walls **500**A-B are placed one after the other. However, for a living unit that is located at the end of a building, the end unit requires installation of an end wall **510** in lieu of a second demising wall **520**B or an exterior window wall **530**A-C. The preferred sequence is to install the end wall **510** with its structural members immediately following installation of the demising walls **500**A-B as described in previous figures. This sequence helps to enclose the construction as soon as possible.

FIG. **23** illustrates cross-sectional details of end wall **510**. An exemplary end wall **510** is composed of metal stud framing **701** with thermal batt insulation **801**, sprinkler plumbing, electrical, and communications components. The wiring and plumbing are pre-installed at a factory and connected at the site. The interior side of the end wall **510** receives a layer of fire-rated sheathing **703**, with a finished panel **704**. The inner wall sheathing **703** is preferably a 12 mm magnesium oxide board, however, other types of fire-rated wall panels with safety mechanisms may be used. The preferred method for finishing the end wall **510** is to attach a finish panel **704** over the end wall **510** at the site using wood or metal cleats **705** installed on the wall sheathing **703**. Several options are available for the exemplary finish panel **704**, including but not limited to, stain, paint, magnesium-oxide board, wood veneer, wood paneling, plaster, metal, wallpaper, and cork. Alternately, the finish panel **704** and cleats **705** may be omitted and the wall sheathing finished in a more conventional manner. More specifically, the wall sheathing may be taped and painted so as long as it achieves the required fire rating per local building codes. A final interior trim piece **710**A-B is installed with fastener **707** in a similar manner to the demising wall **500**A as described above following the secure placement of end wall **510**.

The exterior side of the end wall **510** receives exterior sheathing **803**, a weather resistive barrier **802**, furring channels **804**, preferably metal or similar material, rigid insulation **805**, associated flashing pieces **806**, exterior fasteners **807** and an exterior cladding material **800**. A section of exterior cladding **800**, metal furring channels **804**, rigid insulation **805**, associated flashing pieces **806**, and exterior fasteners **807** is temporarily left off the end wall **510** at the slab edge **450** as a means of providing the connection of the end wall **510** to the floor slab **450** as described below.

The steps to attach the end wall **510** to the floor slab **450** are illustrated in FIG. **23** and described as follows: base and head plates **808**A-B are attached at the face of the slab **450** with fasteners **807** that are drilled at the base and head conditions of the floor slab **450** prior to the end wall **510** being moved into place from the interior side of the building. The end wall **510** utilizes thermally insulated anchors **807** that are securely attached to the slab **450** prior to installing the end wall **510**. The portion of the plate **808**A-B that is attached to the exterior sheathing **803** has pre-punched slots (not shown in the figures) through which the fastener **807** is screwed horizontally to accommodate vertical movement of the end wall **510** due to movement of the slab **450**. Consequently, a horizontal gap allows slight, vertical deflection of the slab **450**. This gap may be filled with rigid insulation **805** or fire-safe materials **711** prior to attaching the final exterior cladding panel.

Upon attachment of the plates **808**A-B to the slab **450** with fasteners **807**, the end wall **510** is moved into place with the exterior wall sheathing **803** abutting the base and head plates **808**A-B. Fasteners **807** are installed in the horizontal direction along the end wall **510** through the weather resistive barrier **802** and into the exterior sheathing **803** to securely attach the end wall **510** to the floor slab **450**. The next step is to attach a "peel and stick" weather resistive barrier **809** over the base and head plates **808**A-B at the base and head of the wall and the floor slab **450** of the end wall **510**. The final step involves attaching the final exterior cladding **800**, metal furring channels **804**, rigid insulation **805**, and associated flashing pieces **806** with fasteners **807** that was temporarily left off allowing access to attachment points of the end wall **510** to floor slab **450**. The installation of this final panel **800** completes the installation of the end walls **510** creating a weather-tight and watertight system.

After the demising walls and end walls are secured in place, the next step involved in constructing the building using the present invention may be to attach utility wall **520** as to further enclose the unit. Each unit **300**A-H and **300**J as shown in FIGS. **6**A-B has a utility wall **520** at the end of every kitchen and bathroom. The utility wall **520** houses common mechanical, plumbing and electrical risers that serve the units **300**A-H and **300**J. All of the utilities to and from the units are accessed at the utility wall **520**. These utility walls **520** are delivered to the site as preassembled, pre-plumbed, pre-wired and prefinished components. The utility walls **520** arrive on-site with all the wall plumbing associated with the kitchen sink, toilet, and shower already in place. The utility walls **520** also include all plumbing supply, vent and drain lines, fire protection, shower valves, shower head, and associated trim. The utility wall **520** further contains the unit's electrical panel and associated wiring. Refer to FIGS. **41-42** for the various components related to the utility wall **520**.

FIGS. **24**A-C and FIG. **25**A-C illustrate the exemplary components that compose the utility wall **520**. The exemplary utility wall **520** has a head track **720**A and a base track **720**B that encompass all framing members of the utility wall **520**. It is further composed of an interior side metal stud frame wall **701** with acoustical blanket insulation layer **702**, wall sheathing **703** and an interior finish material **721**. The utility wall **520** is further composed of an exterior side metal stud frame wall **701** with thermal batt insulation **801**, exterior sheathing **803**, weather resistive barrier **802**, furring channels **804**, rigid insulation **805**, associated flashing pieces **806**, exterior fasteners **807** and an exterior cladding material

800. Possible cladding materials may be comprised of various materials allowed by code, such as, but not limited to, composite panels, phenolic resin panels, metal panels, cement board, lightweight precast concrete panels, wood siding, gypsum fiber reinforced cement panels, ceramic tile, and stone panels. A preferred application for both interior and exterior sheathing material **703**, **803** is a 12 mm magnesium oxide board, however, other similar fire-rated panels or materials may be used. A section of exterior cladding **800**, furring channels **804**, exterior sheathing **803**, rigid insulation **805**, associated flashing pieces **806**, and exterior fasteners **807** is temporarily left off the utility wall **520** at the slab edge **450** (not shown) as a means of providing the connection of the utility wall **520** to the floor slab **450** as providing an access point for connection of the utilities within the utility wall **520**.

As shown in FIG. **26**, the utility wall **520** attaches to the floor slab **450** as follows: base and head plates **808**A-B are attached at the face of the slab **450** with fasteners **807** that are drilled at the base and head conditions of the floor slab **450** prior to the utility wall **520** being moved into place from the interior side of the building. The utility wall **520** utilizes thermally insulated anchors **807** that are securely attached to the slab **450** prior to installing the utility wall **520**. The portion of the plates **808**A-B that are attached to the exterior sheathing **803** has pre-punched slots (not shown in the figures) through which the fastener **807** is screwed horizontally to accommodate vertical movement of the utility wall **520** due to movement of the slab **450**. Consequently, a horizontal gap allows slight, vertical deflection of the slab **450**. This gap may be filled with rigid insulation **805** or fire-safe materials **711** prior to attaching the final exterior cladding panel **800**.

Upon attachment of the plates **808**A-B to the slab **450** with fasteners **807**, the utility wall **520** is moved into place with the exterior wall sheathing **803** abutting the base and head plates **808**A-B. Upon connection of the utilities through the exterior side of the utility wall **520** utilizing the exterior walkway for access, or by other means, the portion of exterior sheathing **803** that was previously left off is attached using fasteners **807**. The utility wall **520** is then securely fastened to the head and base plates **808**A-B with fasteners **807** installed in the horizontal direction along the utility wall **520** through the weather resistive barrier **802** and into the exterior sheathing **803** to securely attach the utility wall **520** to the floor slab **450**. The next step is to attach a "peel and stick" weather resistive barrier **809** over the base and head plates **808**A-B at the base and head of the wall and the floor slab **450** of the utility wall **520**. The final step involves attaching the final exterior cladding **800**, metal furring channels **804**, rigid insulation **805**, and associated flashing pieces **806** with fasteners **807** that was temporarily left off allowing access to attachment points of the utility wall **520** to floor slab **450** as well as to allow for a connection point of utilities within the utility wall **520**. The installation of this final panel **800** completes the installation of the utility wall **520** creating a weather-tight and watertight system.

After the demising walls **500**A-B, end walls **510**, and utility wall **520** are secured in place, the next step involved in constructing the building using the present invention may be to attach the exterior window wall **530**A-D to substantially enclose the unit. Window wall sections are installed in a linear arrangement starting at the end wall as shown in FIG. **27**A. The window wall compensation channel **820**C is abutted to the metal stud framing **701** of the exemplary end wall **510** as previously described in FIG. **23**. The window wall frame **820**A is next securely attached to the compensation channel **820**C and the window wall installation progresses in a linear direction across the exemplary unit. Sealant **713** is installed between the edge of the end wall **510** interior sheathing **703** and the window wall compensation channel **820**C. Upon installation of the sealant **713**, a finish wall trim **714** is attached to the wall sheathing **703**. The interior finish panel **704** is further installed as described in FIG. **23** to complete the interior portion of the interface between the exemplary end wall **510** and the window wall **530**A. Exterior sealant and backer rod **849** is installed on the exterior directly adjacent to the window wall compensation channel creating a weather-tight and watertight system.

FIG. **27**B illustrates a plan view of the interface between a demising wall **500**A with exterior window wall panel **530**D. Window member **820**A is attached to an adjacent window member not shown in the figure. Closure panel **821** is slid into place attaching to the window member **820**A and then securely attached to the floor slab **450** (as described in FIG. **28**). Window member **820**B is next positioned on the slab and is slid into place and securely attached to closure panel **821**. This process continues across the slab until the entire window wall system is securely in place. Upon secure attachment of the exterior window walls **530**A-D to the floor slab **450** (shown in FIG. **28**), the fire-safe material **711**, fire caulk **712**, sealant **713** and wall trim **714** are provided between the demising wall **500**A and the exterior window walls **530**A-D.

FIGS. **28**A-**13** illustrate sectional details for attaching exterior window walls **530**A-B to the floor slab **450**. In order to install exterior window walls **530**A-B, an anchor **822** in the shape of an L with outer ledges bent inwardly is first placed and anchored to the slab **450** by vertically inserting a fastener **823** at the middle portion of the bottom side of the anchor **822** into the slab **450**. The anchor **822** is positioned on and anchored to the slab **450** to leave room for at least half of a large flexible flashing **824** to fit on the remaining portion of the slab **450** towards the edge. The large flexible flashing **824** is shaped around the adjacent components to make a step-like structure with two upper and lower horizontal portions and two upper and lower vertical portions. The large flexible flashing **824**, which is waterproof, is positioned immediately next to the anchor **822** so that the exterior, vertical side of the anchor **822** fits with the upper vertical side of the large flexible flashing **824** and the lower horizontal portion of the large flexible flashing **824** fits snugly on the slab **450**. Half of the lower horizontal portion of the large flexible flashing **824** protrudes out at the edge of the slab **450** as shown in FIG. **28**B.

A slip member **825**A is then anchored firmly to the underside of the slab **450** at the ceiling, or head, portion of the exterior window wall **530**B. The slip member **825**A is shimmed so that it is perfectly level to receive the bottom exterior window wall **530**B with the head support member **826** and rests at its exact elevation. The exterior window walls **530**A-B are constructed to allow approximately ⅝" of shim space at the top and bottom for leveling and alignment. A third fastener **823** is used to attach a head blocking **827** to the underside of the slab **450**. The small flashing **828** is used to seal the head blocking **827**. Upon anchoring the slip member **825**A to its proper position under the slab **450**, the exterior window wall **530**B with the head support member **826** is inserted into the slip member **825**A. Upon securing the head portion of the exterior window wall **530**B with the slip member **825**A, the bottom portion of the exterior window wall **530**A is positioned tightly against the anchor **822** and at the bottom side of the exterior window wall **530**A. As shown in FIG. **28**A, a bottom sill blocking **829** is

attached on top of the slab **450** with the large flexible flashing **824** in-between before positioning the exterior window wall **530**A against the anchor **822**. A final closure piece **825**B is attached at the window head. It should be noted that although head blocking **827** is described in the above invention, the blocking **827** may be omitted. The exterior window wall system contains integrated insulating panels **830** which are included during manufacturing. The completely assembled exterior window walls **530**A-B are shown in FIG. **28**B.

The final step in completely enclosing exemplary units **300**A-H and **300**J involves the installation of the entry door **540**. The entry door **540** is a preassembled, pre-glazed, and prefinished component. FIGS. **29**A-D illustrate the exemplary components of the entry door **540**. The entry door **540** comes with a door portion **840**, inner frame **841** to house the door portion **840**, outer frame **842** to support the entry door **540**, and an operable transom **843** positioned above the door portion **840** within the outer frame **842**. All associated hardware for the door portion **840** and operable transom **843** is pre-installed except for thresholds or covers **844** and the electrical closure chase **845**. The entry door **540** may come in a right-hand or a left-hand door configuration to accommodate different unit layouts. Electrical connections to be made between walls such as the demising walls **500**A-B and the utility wall **520** are made in an electrical closure chase **845** located adjacent to the transom head **846** and the underside of the floor slab **450**.

FIGS. **29**B-D illustrate the steps for attaching the base and head portions of the entry door **540** to the floor slab **450**. As illustrated in FIG. **29**B, at the head portion of the entry door **540**, blocking and shims **847** are installed against the underside of the floor slab **450**. It should be noted that although head blocking **847** is described in the present invention, the blocking **847** may be omitted. The transom head frame **846** is secured against the blocking **847** or the underside of the floor slab **450** with fasteners **807**. The head frame **846** is shimmed so that it is perfectly level to receive the transom **843** and rests at its exact elevation. As illustrated in FIG. **29**D, at the base of the entry door **540**, a weather resistive barrier **802** is placed in the slab depression and integrated into the door threshold **844**. A bed of sealant and rigid insulation **805** is installed prior to the door threshold **844** to create a watertight and thermally isolated installation. The entry door **540** is constructed to allow approximately ⅝" of shim space at the top and bottom for leveling and alignment.

Upon anchoring the head frame **846** to its proper position under the slab **450**, the transom **843** is inserted into the head frame **846**. Upon securing the head portion of the transom **843** with the head frame **846**, the bottom portion of the entry door **540** is positioned tightly against the anchor at the bottom side of the entry door **540**. A closure trim piece **848** is snapped into place into the transom head **846**. An electrical closure chase **845** adjacent to the transom head **846** is snapped into place following the installation of cleats **705** and fasteners **707** on the blocking **847** and the underside of the floor slab **450**. The electrical chase **845** is preferably made of aluminum, however, other types of materials can be used to enclose the conduit. The electrical chase **845** is preferably made of the same material as the entry door frame **842**.

FIG. **30** illustrates the top view of the entry door **540** attached adjacent to the utility wall **520** and perpendicularly attached to the demising wall **500**B. The door portions can be made of glass or any other type of material. The door threshold **844** (not shown) extends out and over the gap created by the walkway (described later) and the floor slab. On the opposite side at the demising wall **500**B whereby the first entry door **540** is adjacently attached to a second entry door **540**A and interfacing perpendicularly with a demising wall **500**B, a closure panel **850** is placed in-between the two entry doors **540**, **540**A so as to provide a watertight installation. This interface as well as the interface of the entry door **540** with the utility wall **520** is further described in FIGS. **31**A-B below.

FIG. **31**A illustrates a detailed top view of the outer frame **842** connecting adjacent to the utility wall **520**A. The weather resistive barrier **802** is wrapped into the entry door frame **842** prior to the frame **842** being installed. Shims **847** are installed to create a plumb installation of the entry door **540**. Sealant and backer rod **849** is further installed between the exterior sheathing and the outer frame **842** such as to create a watertight installation. As shown in FIG. **31**B, the closure panel **850** is inserted and attached between the two entry doors **540**, **540**A, more specifically the two outer frames **842** of the two entry doors **540**, **540**A. The first door member **540** is positioned on the right side of the closure panel **850**. Closure panel **850** with integral insulation **830** is slid into place attaching to the entry door frames **842** and then attached at the floor slabs **450** (as similarly described in FIG. **28**A-B). The second entry door **540**A is placed to the left of the closure panel **850** and secured in the same manner. The entry doors **540**, **540**A are attached on the door members **842** on each side of the closure panel **850**. The entry doors **540**, **540**A, more specifically, the door portions, are swinging doors and are attached to the door members **842** of the closure panel **850**. Similar to the demising wall **500**A interface with the window wall **530**A as described in FIG. **27**B, the void between the demising wall **500**B and the closure panel **850** needs to be made watertight. Upon secure attachment of the closure panel **850** to the floor slab **450**, the fire-safe material **711**, fire caulk **712**, sealant **713** and wall trim **714** are provided between the demising wall **500**B and the closure panel **850** in a similar process as described in FIG. **27**B.

After the exemplary units **300**A-H and **300**J are fully enclosed utilizing the steps outlined above, the next step of constructing a building is connecting utility components and installing fixtures. All of the unit's utility connections occur at the utility wall **520**. The electrical and communications main lines run vertically in the utility wall **520**. At each unit, the electrical service feeds directly into the utility wall's **520** breaker panel. Wiring connections to other wall components occur via pre-installed wiring. Electrical and communications connections are carried out at the time of installation of each adjacent utility wall **520**. In FIG. **32**A, a side view of the utility wall **520** is shown without the bath and kitchen components in place. The shower pan **612**A with the integral drain **613** is set in grout after installing the utility wall **520** (described later). The utility wall **520** has exhaust vents **614**A-B located respectively in the bathroom and kitchen on upper portions of the utility wall **520**. The utility wall **520** also has first and second plumbing **615**A-B for supply and waste for connecting a bathroom sink **610**, a kitchen sink **601**, as well as a toilet outlet **619** for connecting toilet **611**. There is a plurality of outlets **616** located in the utility wall **520** for the bathroom and kitchen. The utility wall **520** that arrives on-site also has a pre-integrated shower head **617** and shower valves **618**.

FIG. **32**B illustrates the utility wall **520** with bathroom and kitchen components installed on the utility wall **520**. Installation of plumbing fixtures may occur immediately after utility connections are made to the utility wall **520**. The toilet **611** is installed on the utility wall **520**, bathroom

vanities **610** arrive on-site preassembled with the sink and associated out-of-wall plumbing pre-installed and ready for immediate connection to the building's systems. Kitchen units **600**C are pre-fabricated, prefinished kitchen upper and base cabinets. These kitchen units **600**C arrive at the site pre-drilled and trimmed for plumbing, electrical connections and vent ducting. Cabinets **603** have integral exhaust fans and light fixtures to be installed on the utility wall **520**. The bathroom mirror/medicine cabinet **650** is installed at the same time as the other bathroom fixtures. All wiring within a given unit feed back to the unit's electrical panel.

The shower pan **612**A and integral drain **613** are set on the slab or into a recess within the floor slab **450**. In FIG. **33**A, the first shower partition **620**A is shown to divide the shower portion from the bathroom portion. The bathroom vanity **610** and toilet **611** are also shown. FIG. **33**B illustrates the recess or depression is cast into the slab **450** and shaped to receive the shower pan **612**A. The shower pan **612**A may be field set in grout after the installation of the utility wall **520**. FIGS. **34**A-B illustrate the shower pan **612**A-B set into the slab **450** recess with the integral drain **613** running vertically through the slab **450**, or as shown in FIG. **34**B, horizontally through the slab **450** and into the cavity of the utility wall **520**. Thus, the recess with the integral drain **613** permits controlled passage of water from slab **450** into the cavity of the utility wall **520**. The shower pan as currently described is fiberglass **612**A or an integrated stainless steel pan **612**B. The present invention does not limit the other possible material choices for the shower pan. In addition, a slab recess may be omitted from the present invention.

The next step of construction is installing interior bathroom partitions **620**A-B, and **621** as shown on FIGS. **10** through **18** for separating the shower area from the bathroom and the bathroom area from the living area. The shower and bathroom partitions preferably, but without limitation, include about a ½" full height frosted or clear tempered glass panel and a full height frosted sliding glass door panel. The head portions of the bathroom partitions **620**A-B and **621** as shown in FIGS. **10** through **17** are used to attach to the bottom side of the ceiling slab **450**. A rigid C-shaped receptor channel **735** is attached to the underside of the floor slab **450** or to the underside of blocking **734** using a head anchor **733** as illustrated in FIG. **35**A. It should be noted that although head blocking **734** is described in the above invention, the blocking **734** may be omitted from the present invention. The receptor channel **735** is preferably approximately 2" deep and 2" wide so that the top portion of the glass partition **730** is inserted at least half way into the receptor channel **735**. Sealant will be provided at vertical wall joints where the glazing acts as a shower enclosure.

The bottom portions of the shower and bathroom partitions **620**A-B and **621** are used to attach to the floor slab **450**. A rigid C-shaped bottom receptor channel **732** is attached to the floor slab **450** by a bottom anchor **736** to insert the glass partition **730** as illustrated in FIG. **35**A. The partition **730** is fully positioned within the bottom receptor channel **732** so that it rests securely in the receptor channel. Sealant **713** is applied to both sides of the glass partitions **730** to make for a secure and tight assembly. Furthermore as illustrated in FIG. **35**B, at sliding door panel **731**, a sliding door guide **738** is adjacently positioned on the floor slab **450** next to the bottom receptor channel **732** and attached to the floor slab **450** by drilling two bottom anchors **736** through the flat portions of the sliding door guide **738** and into the floor slab **450**. The door panel **731** is then positioned into the head receptor channel **735** and into the sliding door guide **738** at the floor slab **450**. As shown in FIG. **35**C, to complete the assembly of the shower and bathroom partitions **620**A-B, a trim piece **737**, preferably made of aluminum, is sealed against the head blocking **734** and receptor channel **735**.

The next step of construction is installing interior bedroom partitions **640**, **642** for separating rooms or configuring rooms with different layouts as shown in FIGS. **10** through **18**. Interior partitions **640** and **642** are minimal and in most cases, the bedroom partitions **640** and **642** are removable, and the location of the partitions is easily adjustable. The partitions **640**, **642** are typically used to help establish privacy between the bedroom and the living area with exemplary unit **300**C-H and **300**J. The two main exemplary types of partitions include a tempered glass sliding bedroom glass partition **640** and a removable entertainment wall **642** with tempered glass sliding pocket doors. These two types of partitions are completely interchangeable within exemplary unit **300**C-J.

FIGS. **36**A-B illustrate an exemplary sliding glass partition **640** as shown in FIGS. **14-17**. The sliding bedroom glass partitions **640** are suspended from a sliding door track **742** mounted to the underside of the floor slab **450**. The sliding bedroom glass partitions **640** are further sitting over a sliding door guide **741** on the slab **450**. Blocking and shims **734** are used to perfectly level the sliding door track **742** at the underside of the slab **450**. Head anchors **733** and base anchors **736** attach directly to or drill into the surface of the floor slab **450**. A sliding bedroom partition **640**, whether made of glass or other materials, is attached to a sliding door guide **742** previously attached to the underside of the floor slab **450** via a head anchor **733**. The sliding door guide **736** basically guides the sliding bedroom glass partition **640** so that it can slide open and close easily. The protruding frame **743** from the top portion of the sliding bedroom glass partition **640** extends into the sliding door track **742**. Upon completion of the installation as described above, finish trim pieces **737** are attached to conceal the sliding partition track **742** and blocking and/or shims **734**.

FIGS. **37**A-C illustrate an exemplary entertainment wall **642** and glass pocket door **643** as shown in FIGS. **16-17**. The exemplary entertainment wall **642** and glass sliding pocket door **643** that can be utilized in addition to, or in lieu of, the glass sliding partition **640** to further separate bedroom areas from living areas. The first partition of exemplary entertainment wall **642** is brought to the construction site as a pre-fabricated and prefinished component ready for installation. As illustrated in FIG. **37**A, the components of this wall include metal stud framing **701** and wall sheathing **703** located only on one side of the wall. The cavity side of the wall is left as bare metal stud framing **701**. This open cavity wall is set into place over a neoprene pad **708** and secured into place with head anchor **733** and base anchor **736**.

As illustrated in FIG. **37**B, the glass sliding pocket door **643** is installed similarly to the process for installing exemplary bedroom partition **640** as described in FIGS. **36**A-B above. The glass sliding pocket door **643** is suspended from a sliding door track **742** mounted to the underside of the floor slab **450**. The sliding bedroom partition **640** is further sitting over a sliding door guide **741** on the slab **450**. Blocking and shims **734** are used to perfectly level the sliding door track **742** at the underside of the slab **450**. Head anchors **733** and base anchors **736** attach directly to or drill into the surface of the floor slab **450**. A glass sliding pocket door **643**, whether made of glass or other materials, is attached to a sliding door guide **742** previously attached to the underside of the floor slab **450** via a head anchor **733**. The sliding door guide **736** basically guides the glass sliding pocket door **643** at the top portion so that it can slide open

and close easily. The protruding frame **743** from the top portion of the glass sliding pocket door **643** extends into the sliding door track **742**.

To complete the installation of the entertainment wall **642** as illustrated in FIG. **37**C, a second prefabricated and prefinished framing wall is brought to the construction site ready for installation. The components of this wall include metal stud framing **701** and wall sheathing **703** located only on the room side. The cavity side of the wall is left as bare metal stud framing. This wall will arrive to the construction site with the lower portion of interior sheathing left off at the head and base of the wall as a means of allowing access to attach the base and head to the slab with anchors **733** and **736** respectively. Upon attachment of the second prefabricated wall, the interior sheathing strips are attached to wall frame **701**. The next step is to cover the inner side of the entertainment wall **642** by attaching the base and head trim **710**A-B, preferably made of metal or other similar materials. Base and head trim **710**A-B is attached with fastener **707** on both interior sides of the wall. Prefinished panels **704** are further attached to the entertainment wall **642** with cleats **705** to complete the installation as previously described in FIGS. **19-22** relating to the demising wall.

The final step of construction may be assembling the parapet for the roof as shown in FIGS. **38-39**. In this application, the installation of the parapet, roof insulation and the roof membrane occur simultaneously with the installation of the interior components. In the preferred application, the parapet, roof insulation, roof membrane and associated components will occur prior to the roof slab being hoisted and set into place. This is one of several options for a unitized prefabricated system of enclosing the roof of the building that may include panelized overhangs, shading devices, canopies, solar panels, and/or fabric tent structures. Therefore, this example is not to be limiting in nature. The exemplary parapet connects to the roof slab **450** and accommodates the building's roofing membrane flashing and garden roof conditions.

As illustrated in FIG. **38**A, the parapet consists metal stud framing **701** and exterior sheathing **803** on both sides. Furthermore, it typically contains integral flashing to prevent water penetrations between the parapet wall and the top of the exterior window wall **530**B or the end wall **510**. The exterior sheathing **803** is preferably a 12 mm magnesium oxide board, however, other types of wall sheathing panels may be used. Exemplary prefabricated parapet walls may be delivered to the project site in varying lengths, but are preferably about 10 feet in length. As shown in FIG. **38**B, the parapet wall is securely anchored on top of the roof slab **450** using a similar method as the end wall **510** as described previously in FIG. **23**. Base plates **808**A are attached at the face of the slab **450** with fasteners **807** that are drilled at the base condition of the floor slab **450** prior to the parapet wall being moved into place from the roof side of the building as shown in FIG. **38**B. The parapet wall utilizes thermally insulated anchors **807** that are securely attached to the slab **450** prior to installing the parapet wall.

Upon attachment of the plate **808**A to the slab **450** with fasteners **807**, the parapet wall is moved into place with the exterior wall sheathing **803** abutting the base plate **808**A. Fasteners **807** are installed in the horizontal direction along the parapet wall through the weather resistive barrier **802** and into the exterior sheathing **803** to securely attach the parapet wall to the floor slab **450**. The next step is to attach a "peel and stick" weather resistive barrier **809** over the base plate **808**A at the base of the wall and the floor slab **450** of the parapet wall. The exterior cladding **800**, metal furring channels **804**, rigid insulation **805**, and associated flashing pieces **806** with fasteners **807** are then applied to the exterior portion of the parapet wall **760** and integrally flashed with the window wall **530**B or end wall.

As shown in FIG. **38**B, the roof membrane **860** is next applied over the roof slab **450**, up the exterior sheathing **803** on the parapet wall, over the blocking **863** and also over the sheathing layers **803** of the parapet wall and integrally connected into the flashing of the exterior window wall **530**B or end wall **510**. A flashing cap member **861** is attached over the top of the parapet wall. The cap support member **862** is placed on top of the parapet wall and attached to the upper, roof side of the parapet wall. The cap support member **862** supports the top, horizontal part of the flashing cap member **861**. The top portion of the exterior cladding catches the vertical part on the exterior side of the flashing cap member **861**, to tightly keep the flashing cap member **861** over the parapet wall.

The majority of the building's roof is a flat membrane roof. In one of the exemplary applications, the roof area has a garden roof system. The garden roof system is a low-maintenance, vegetated roof system which helps reduce heat island effects, retains storm water runoff, and provides insulation benefits. This vegetated roof system may include recycled material in either a complete vegetated system, or a modular vegetated system. The cover provided by the planting minimizes the impact from UV and varying temperatures on the surrounding environment and increases the life of the roof system. In one of the exemplary applications, an Inverted Roof Membrane Assembly (IRMA) also called a Protected Roof Membrane (PRM) system may be installed after the parapet wall is installed. A monolithic, thermoplastic roofing membrane **860** is placed directly on the concrete roof slab **450**. This monolithic, thermoplastic roofing membrane **860** is a fully adhered, seamless, self-healing membrane that can be mopped onto the top of the roof slab **450**. Upon applying the roofing membrane **860**, the roof is covered with a fiberglass-reinforced protective layer or roof barrier, and additionally covered with a layer of CFC-free, closed cell rigid insulation **864** as an air barrier. The thickness of the insulation layers **864** are determined by the local environment and governing thermal design values.

As shown in FIG. **39**A, the tapered rigid insulation layer **864** is applied over the roof membrane **860** which is covered by a water retention mat **865** that provides drainage and aeration for the planting **867**. The mat **865** also retains some of the run-off water and provides plant irrigation via capillary action. This mat **865** is further covered with soil filter fabric and then a lightweight engineered soil or growth media **866** as illustrated in FIG. **39**B. The lightweight growth media **866** is further covered with a wind barrier planting fabric. The wind barrier planting fabric reduces soil erosion and dust while allowing the planting **867** to grow. The planting **867** is a lightweight planting providing superior water holding capacity. If an irrigation system is to be installed, the irrigation system can be installed in conjunction with the placement of growth media **867**. Plants used in the planting **867** are typically of shallow root and drought-tolerant variety, but these embodiments are not intended to be of a limiting nature. The planting **867** may be delivered to the site in pre-planted blankets or in pre-planted modular grids.

Sloped roofing may be used in selective locations such as independent walkways, areas with stairs and elevator landings. Translucent roof panels may be used at sloping roofs to allow as much natural light as possible to the areas below.

Any run-off from the roof surfaces are collected and stored as gray water for irrigating plants on the vegetated roof and in-the-site landscape.

The application of the exterior walkways is preferably attached to the columns and/or beams **405**, **410** immediately following the erection of the structural frame **400** and is determined by the overall building configuration and the need for structural framing adjacent to the face of the building. This preferred sequencing allows the exterior walkways to be utilized in attachment of the slabs to the structural frame as well as allowing easy access to the individual units. In FIG. **40**, a continuous horizontal beam **410** is attached between vertical columns **405** on all elevations. The horizontal beams **410** act as drag struts for the brace frame and helps provide torsional restraint for the vertical columns **405** under jacking loads. A column support member **871**A-B, or a bolt-on system, may be used for all exterior walkways. The column support member **871**A-B is bolted **872** to the horizontal beam framing system **410**. Pre-fabricated and prefinished planks **870** are placed on top of the structure **410**, **871**A-B to provide the walking surface for the exterior walkways. The preferred material is precast concrete, but this is not meant to be limiting in nature. Alternatively, common walkways can be part of the unit floor slab **450** and utilize the same support system as the unit slabs **450**. In these conditions, a thermal break is cast into the slab **450** under a unit's exterior wall. The extension of the slab **450** helps reduce reinforcing requirements in the main portion of the slabs **450**, and there is no horizontal beam **410** framing to interfere with lifting.

As further illustrated in FIG. **40**, a pre-fabricated and pre-bundled guardrail system **875** may be attached and secured to the walkway support system utilizing bolts **872**. The preferred guardrail in the present invention includes a glass panel **876**, receptor channels **873**, and horizontal pickets **874**, but this is not meant to be limiting. Several other options include, but are not limited to, aluminum, metal and cable systems.

FIGS. **41-42** refer to the various components of the utility wall as previously described in FIGS. **24-26**. As shown in FIG. **41**, the utility wall **520** is delivered to the site as a pre-manufactured, pre-plumbed, pre-wired, prefinished, pre-assembled and pre-bundled component. Possible cladding materials may be comprised of various materials allowed by code, such as, but not limited to, composite panels, phenolic resin panels, metal panels, cement board, lightweight precast concrete panels, wood siding, gypsum fiber reinforced cement panels, ceramic tile, and stone panels. The utility wall **520** may be an all-encompassing finished unit on both the interior and exterior sides. This invention does not preclude the elimination of one or more parts of this component to achieve a more efficient installation method in the field. For example, the utility wall **520** could arrive on-site without the furring channels **804**, rigid insulation **805**, exterior cladding **800**, interior finish material **704**, and access panel **880** and vent hood **881**. Utility wall **520** is composed of metal stud framing **701**, an integrated acoustical blanket insulation layer **702** within the interior stud of the utility wall **520**, an interior sheathing panel **703** and an interior finish material **704**. The utility wall **520** arrives on-site with all the wall plumbing and necessary blocking associated with the kitchen sink, counters, cabinets, toilet, and shower already in place. The utility wall **520** also includes the shower valves, shower head, and associated trim. The utility wall **520** further contains the unit's electrical panel **882** and water heater **883** behind an accessible panel **880**. The present invention also contemplates use of a utility wall that does not contain a separate water heater, but instead uses a shared water heater or other similar device. The exterior side of the utility wall **520** is composed of metal stud framing **701**, an integrated thermal batt insulation layer **801** within the exterior stud of the utility wall **520**, fire-rated exterior sheathing board **803**, weather resistive barrier **802**, furring **804**, rigid insulation **805**, exterior cladding **800** and an access panel **880**.

As shown in FIG. **42**, the supply and waste lines **884**A-B are extended beyond the top plate **885** as a means of connecting risers in a vertical orientation within a multi-story building. In an exemplary multi-story building, units are identically stacked vertically on each level of the multi-story building. The utility walls **520** are similarly identical in construction of each unit and are also stacked vertically on each level of the multi-story building. The supply and waste piping extensions of one exemplary utility wall **520** extend through the top plate **885** enough to extend through the floor system and into the bottom plate **886** of the second exemplary utility wall **520** located on the level above of a multi-story building. In an exemplary multi-story building, units and levels are identically stacked vertically throughout the building with the exemplary utility wall **520** stacked as described above. As the utility wall **520** is placed into position, the piping extensions **884**A-B penetrate through the top plate **885** and the floor system and into the bottom plate **886** of the utility wall **520** above. The utility wall **520** is subsequently anchored into position using a variety of methods available. After secure attachment of the utility wall **520** to the floor, connections are made through the lower portions of the exemplary utility wall **520** for supply and waste piping **884**A-B. This process is repeated for as many levels as required to complete the multi-story building.

Two Through Four Bedroom Units

The steps described in FIGS. **19-42** describe the sequence of assembling a standard sized studio or one bedroom unit **300**B-C of FIG. **6**A. The present invention may be readily adapted to create units with multiple bedrooms and bathrooms, as described in the next steps for exemplary two through four bedroom units.

A two bedroom unit of the present invention may be one and half times longer than a studio unit. Four bedroom units are typically twice the size of a standard studio unit. There are also standard plans for two and three bedroom corner units and efficiency units as shown in FIG. **6**B. Standard wall and partition components are available which accommodate the larger units. If the overall plans for the building include a mix of unit types, the following sequence of assembly is applicable for multiple bedroom units. Living units that are 30 feet and wider may have a room against the exterior wall at the chase wall side of the unit. If these rooms are to be used as bedrooms, building code may require that a door or window be provided that is large enough to accommodate egress. In these types of conditions, exterior walls can be used. The exterior wall is composed and anchored in exactly the same manner as the end walls **510** as shown in FIG. **23**. The exterior walls are provided in a different configuration than the end walls **510** since the exterior walls have a window or door included.

The first step of constructing multiple bedroom units is delivering and staging of demising walls **500**A-B as described in FIGS. **19-22**. As previously described in FIGS. **19-22**, the demising walls **500**A-B are delivered to the site and staged in each unit for installation.

The next step of constructing multiple bedroom units is placing end walls **510**A-B for units as described in FIG. **23**.

The longer two and four bedroom units utilize the same end walls **510**A-B as a standard studio unit. However, in order to accommodate the longer multi-bedroom unit, an additional exterior wall is to be provided. The exterior walls are composed and anchored in exactly the same manner as the end walls **510**A-B. The exterior walls may be provided in a different configuration than the end walls **510**A-B and may have a window or door included. If the exterior wall encloses a bedroom, then the building code may require that a door or window be provided that is large enough to accommodate egress within the exterior wall.

Similar to the end walls **510** as shown in FIG. **23**, exterior walls are composed of metal stud framing **701** with thermal batt insulation **801**, sprinkler plumbing, electrical, and communications components. The wiring and plumbing are pre-installed at a factory and connected at the site. The interior side of the exterior wall receives a layer of fire-rated sheathing **703**, with a finished panel **704**. The inner wall sheathing **703** is preferably a 12 mm magnesium oxide board, however, other types of fire-rated wall panels with safety mechanisms may be used. The preferred method for finishing the exterior wall is to attach a finish panel **704** over the exterior wall at the site using wood or metal cleats **705** installed on the wall sheathing **703**. Several options are available for the exemplary finish panel **704**, including but not limited to, stain, paint, magnesium-oxide board, wood veneer, wood paneling, plaster, metal, wallpaper, and cork. Alternately, the finish panel **704** and cleats **705** may be omitted and the wall sheathing finished in a more conventional manner. More specifically, the wall sheathing may be taped and painted so as long as it achieves the required fire rating per local building codes. A final interior trim piece **710**A-B is installed with fastener **707** in a similar manner to the demising wall **500**A as described above following the secure placement of exterior wall.

The exterior side of the exterior wall receives exterior sheathing **803**, a weather resistive barrier **802**, furring channels **804**, preferably metal or similar material, rigid insulation **805**, associated flashing pieces **806**, exterior fasteners **807** and an exterior cladding material **800**. A section of exterior cladding **800**, metal furring channels **804**, rigid insulation **805**, associated flashing pieces **806**, and exterior fasteners **807** is temporarily left off the exterior wall at the slab edge **450** as a means of providing the connection of the exterior wall to the floor slab **450** as described below.

Similar to the end walls **510** as shown in FIG. **23**, the exterior walls are attached to the floor slabs as follows: upon attachment of the plates **808**A-B to the slab **450** with fasteners **807**, the exterior wall is moved into place with the exterior wall sheathing **803** abutting the base and head plates **808**A-B. Fasteners **807** are installed in the horizontal direction along the end wall **510** through the weather resistive barrier **802** and into the exterior sheathing **803** to securely attach the exterior wall to the floor slab **450**. The next step is to attach a "peel and stick" weather resistive barrier **809** over the base and head plates **808**A-B at the base and head of the wall and the floor slab **450** of the exterior wall. The final step involves attaching the final exterior cladding **800**, metal furring channels **804**, rigid insulation **805**, and associated flashing pieces **806** with fasteners **807** that was temporarily left off allowing access to attachment points of the exterior wall to floor slab **450**. The installation of this final panel **800** completes the installation of the exterior wall creating a weather-tight and watertight system.

The next step of construction is placing the utility wall **520** as previously described in FIGS. **24-26**, **41** and **42**.

As previously described in FIGS. **27-28**, the next step of constructing multiple bedroom units is installing the exterior window walls **530**A-D. The sequence for the delivery and installation of the exterior window walls **520**A-D and components are described in FIGS. **27-28**.

The next step of constructing multiple bedroom units is installing the entry door **540**A-B and its associated parts. Installation of the entry door **540**A-B is described in FIGS. **29-31**.

The next step of constructing multiple bedroom units is connecting utility components and installing fixtures. The sequence of the utility connections and placement of the plumbing fixtures are described in FIG. **32-33**.

The next step of constructing multiple bedroom units is inserting a shower pan **612**A-B with an integral drain **613** into a recess **470** within the floor slab **450** as described in FIG. **34**.

The next step of constructing multiple bedroom units is installing interior partitions for separating rooms or configuring rooms with different layouts as described in FIGS. **35-37**.

The final step of constructing outer structures such as the parapet wall, roof, and exterior or common walkways are the same as previously described in FIGS. **38-40**. The sequencing of the installation of the roof and exterior walkways may occur prior to the slabs being hoisted as a means of accessing the attachment points of the slabs to the structural framing.

It should be noted that relative terms are meant to help in the understanding of the structures and are not meant to limit the scope of the invention. Similarly, the term "head" is meant to be relative to the term "base," and the term "top" is meant to be relative to the term "bottom." It should also be noted that the term "right" is meant to be relative to the term "left," and the term "horizontal" is meant to be relative to the term "vertical." Furthermore, the present invention is described in terms of perpendicular and parallel in direction, the terms are not meant to be limiting. It should be further noted that although the present invention is described in terms of first and second walls, the terms are not meant to be limiting. It should be further noted that although the present invention is described using certain structures such as fasteners, however, any other types of means can be used to attach the walls.

The terms and expressions that have been employed in the foregoing specification are used as terms of description and not of limitation, and are not intended to exclude equivalents of the features shown and described. This application is intended to cover any adaptations or variations of the present invention. It will be appreciated by those of ordinary skill in the art that any arrangement that is calculated to achieve the same purpose may be substituted for the specific embodiment shown.

What is claimed is:

1. A multi-story building construction system comprising:

slab construction, wherein a monolithic slab of the slab construction spans an entire story of the multi-story building;

pre-manufactured non-weight bearing walls, wherein the pre-manufactured non-weight bearing walls include an interior surface and an exterior surface, wherein the exterior surface forms at least a portion of an exterior of the multi-story building; and

external load-bearing structural framing including:

a plurality of vertical columns;

a horizontal beam coupled to at least two of the vertical columns; and

a diagonal brace coupled to at least the horizontal beam or at least two of the vertical columns;

wherein the slab of the slab construction is prefabricated and coupled to the load-bearing structural framing around an exterior perimeter of the slab.

2. The construction system of claim **1** wherein the pre-manufactured non-weight bearing walls include one or more of a utility wall, end wall, exterior wall, and exterior window wall.

3. The construction system of claim **2** wherein the utility wall includes features that allow the stacking and connection of utilities from one building story to the next.

4. The construction system of claim **2** wherein at least one of the pre-manufactured non-weight bearing walls is prefinished prior to installation in the building.

5. The construction system of claim **2** further including at least one of a roof slab and a floor slab, wherein the at least one of the roof slab and the floor slab is configured to couple to the external load-bearing structural framing.

6. The construction system of claim **5** wherein the floor slab includes at least one recess or depression.

7. The construction system of claim **6** wherein the recess or depression permits controlled passage of water from the floor slab to the utility wall.

8. The construction system of claim **1** wherein the monolithic slab of the slab construction includes at least one of steel reinforcing bars or post tensioned cables.

9. The construction system of claim **1**, wherein the monolithic slab of the slab construction includes radiant heat coils.

10. The construction system of claim **1**, wherein the monolithic slab of the slab construction is configured to act as at least one of a finished floor for a unit above the floor slab or a finished ceiling for a unit below the floor slab.

11. The construction system of claim **1**, wherein the monolithic slab of the slab construction includes an acoustical isolation material.

12. The construction system of claim **1** wherein the pre-manufactured non-weight bearing walls are adapted for use in slab construction.

13. The construction system of claim **1** further including a building foundation that supports the load-bearing structural framing.

14. The construction system of claim **13** wherein the external load-bearing structural framing is located around the perimeter of the building foundation.

15. The construction system of claim **1** further including at least one exterior walkway.

16. The construction system of claim **1** wherein the building is at east one of a residential, institutional, and commercial building.

17. The construction system of claim **1** wherein the building has at least two identical units.

18. The construction system of claim **1** wherein the building further includes at least one of a parking level and a retail level.

* * * * *

UNITED STATES PATENT AND TRADEMARK OFFICE

CERTIFICATE OF CORRECTION

PATENT NO. : 9,493,940 B2
APPLICATION NO. : 13/700429
DATED : November 15, 2016
INVENTOR(S) : Collins et al.

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

On the Title Page

In Item (75), under "Inventors", in Column 1, Line 1, Delete "Arlan" and insert -- Arlan E. --, therefor.

In Item (75), under "Inventors", in Column 1, Line 1, Delete "Mark" and insert -- Mark L. --, therefor.

In the Specification

In Column 1, Line 10, delete "§371" and insert -- § 371 --, therefor.

In Column 1, Line 12, delete "§120" and insert -- § 120 --, therefor.

In Column 1, Line 17, delete "§120" and insert -- § 120 --, therefor.

In Column 1, Line 18, delete "filed" and insert -- filed on --, therefor.

In Column 24, Line 28, delete "28A-13" and insert -- 28A-B --, therefor.

In the Claims

In Column 36, Line 21, in Claim 16, delete "east" and insert -- least --, therefor.

Signed and Sealed this
Twentieth Day of June, 2017

Joseph Matal

Joseph Matal
Performing the Functions and Duties of the
Under Secretary of Commerce for Intellectual Property and
Director of the United States Patent and Trademark Office